PRR-70-5

NAVAL AIR ADVANCED TRAINING COMMAND

Manpower Allocation and Productivity Measurement Model

FINAL REPORT

Contract N00022-69-C-0100
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FOREWORD

This Final Report for the Naval Air Advanced Training Command (CNAVANTRA) Manpower Allocation Mdel and Productivity Measurement Model is submitted in performance of Contract No. N00022-69-C-0100. The report describes model formulation, assumptions and the data base used to demonstrate model operations. Outputs for models are separately bound. Operational instructions and computer program documentation are provided in a Users Manual.

SUMMARY

The Manpower Allocation Model (MAM) and Productivity Measurement Model (PMM) for CNAVANTRA were developed to provide Navy management with tools for improved manpower planning, programming, and budgeting. Development of the models included an investigation of the available data and an analysis of the processes which take place at the various CNAVANTRA facilities. After the models were formulated, computer programs were written, tested, and run using available data.

The MAM provides the quantitative means of examining manpower requirements for:

1) Corpus Christi, Texas: NAS Corpus Christi, VT27, VT28, VT29, VT31, and CNAVANTRA staff;
2) Beeville, Texas: NAS Chase, VT24, VT25, and VT26;
3) Kingsville, Texas: NAS Kingsville, VT21, VT22, and VT23;

to support a range of pilot training rates in increments selected by the user. The annual pilot training rates used to run the model were 600 to 1800 in increments of 400 for advanced jet aircraft pilots (NAS Chase and Kingsville), and from 360 to 1440 in increments of 360 for advanced propeller aircraft pilots (NAS Corpus Christi).

The MAM was developed using the technique of process analysis to examine the work flow of the CNAVANTRA facilities. Process analysis provides the mathematical structure for the model in terms of labor inputs, intermediate products, and final outputs (trained pilots). This structure, combined with linear programming techniques, is used to determine the optimum (least-cost) manpower requirements for a particular pilot training rate. The effects, in terms of manpower and costs, of policy constraints imposed on the number of use of particular labor skill categories can also be analyzed.

The model incorporates the Resource Management System (RMS) Project PRIME cost and subcost center identification organization. The model is designed to use data from RMS PRIME, OPNAV 5320, Enlisted Distribution and Verification Report (BUPERS Report 1080-14), and Student Training Progress Critique. Other sources of data can also be used.

For each pilot training rate, the manpower requirements for each subcost center are specified in terms of the billet identification, the labor skill category. The labor skill category is further defined in terms of labor classification: officer, warrant officer, enlisted men, graded civilians, and ungraded or wage board civilians. The appropriate designator for officers, the rating for enlisted men, and the series for civilian personnel are specified. Where appropriate, based on input data, the

NEC/NOBC are identified. The rank, rate, or grade is also listed to indicate the proficiency level of the labor skill.

The model provides the required manhours per month, the equivalent number of people in each labor skill category, and summaries for the cost center. It also determines the required units for each subcost center functioning with the optimum manning.

In addition to this output, other data is available from the linear programming algorithm which can be extremely useful to a manpower requirements analyst. This includes information concerning marginal values, transfer prices, ranges and interrelationships of the inputs, intermediate products, and final outputs at optimality. Because of the lack of realistic constraints (upper and lower bounds) and a range of technologies, however, the solutions provided in demonstrating model operation do not reflect the total model capability.

Based on the structure, inputs and outputs of the CNAVANTRA activities, the PMM was developed to provide conventional productivity measures, productivity indices, and aggregate productivity indices.

The PMM is intended to provide managers with a means of comparing an activity's performance to particular standards. It may also be used to compare the performance of similar and dissimilar activities.

The PMM uses the monthly RMS PRIME 7000-8 and 7000-9 reports as its sources of data. Types of data taken from these reports are the work units accomplished, together with labor hours and dollars expended. The standard productivity index may be specified by the user. The PMM computes a cumulative average of productivity indices for each subcost center that may be used as the standard. Other standards, such as engineered standards may be used. The Manpower Allocation Model (MAM) determines the optimal manning and associated optimal work units for each subcost center necessary to support a particular pilot training rate. This data may be used to form standards for use in the PMM.

Thus, the PMM can be used independently or in conjunction with MAM. Both models utilize the RMS data base structure. By providing the actual ratio of outputs to labor costs and manhours, the PMM can verify the predicted optimal ratio of output to inputs generated by the MAM.

A general framework is also provided for operationally implementing the models in order to satisfy data requirements in the DoD Planning, Programming, and Budgeting System (PPBS).

A users manual containing operational instructions and computer program documentation is available under separate cover.

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SECTION 1

GENERAL

OBJECTIVE OF STUDY

> The MAM was developed to provide management with a tool for determining the optimal allocation, computation, and justification of manpower requirements for three naval air stations, and their associated squadrons and staff, of CNAVANTRA. The PMM was developed to provide management with the ability to evaluate and compare manpower performance.

The Chief of Naval Air Advanced Training (CNAVANTRA) is responsible, within the Navy pilot training program, for providing advanced pilot training in multi-engined propeller aircraft and in jet aircraft. The study objective involved the development of a unique Manpower Allocation Model (MAM) for each of the three naval air stations of CNAVANTRA (NAS Corpus Christi, NAS Kingsville, and NAS Chase) and their associated squadrons and staff.

NAS Chase and NAS Kingsville, which host training squadrons VT24, VT25, VT26, and VT21, VT22, VT23 respectively, provide the advanced jet pilot training. The MAM's for these air stations determine optimum manpower requirements to support a pilot training rate (PTR) for 600 to 1800 jet pilots per year in increments of 400. Other beginning (lowest), ending (highest), and incremental output levels may be implemented to reflect proposed policy changes in the pilot training program. The MAM for NAS Corpus Christi (and its training squadrons VT27, VT28, VT29, and VT31) determines optimal manpower requirements to support a PTR for 360 to 1440 prop pilots per year in increments of 360. Other incremental output levels may also be programmed. All of the above PTR's were based upon an average pilot training rate which was computed using two years of data as an empirical base. From this computed average, the initial and final PTR's were prescribed as 50 percent and 150 percent of the average, respectively. The increment was then determined as one-fourth of the final pilot training rate.

The MAM, as developed, may be said to have three specific attributes. The first is a capability to rapidly predict manpower requirements for varying workloads or PTR's of CNAVANTRA. The second function of the MAM is to provide, for management, an optimal (least-cost) mix of the above requirements by function, category, grade, and skill level. The third objective is to examine the effect of manpower policy constraints on the manpower allocation and associated costs (sensitivity analysis).

The Productivity Measurement Model was developed using the same data base as the MAM. The purpose of the model is to form conventional productivity measures, productivity indices (comparisons to a standard), and aggregate productivity indices. The objective in applying the models is to use the MAM in order to produce optimal manpower and output requirements, and to use the PMM in order to verify performance.

SYSTEMS DESCRIPTION

The CNAVANTRA organizational structure reflects the relationship of command to the pilot training process.

The principal organization elements of CNAVANTRA which relate to the pilot process are illustrated in Figure 1-1. The solid lines of Figure 1-1, connecting air stations and training squadrons, represent the influence of training squadron activity upon the manpower requirements of the air stations. The dotted lines of Figure 3-1, connecting the training squadrons and staff, indicate that the staff organization of CNAVANTRA is directly responsible for all policy decisions regarding the operation of the training squadrons, but not the operation of the air station where the training squadron is located.

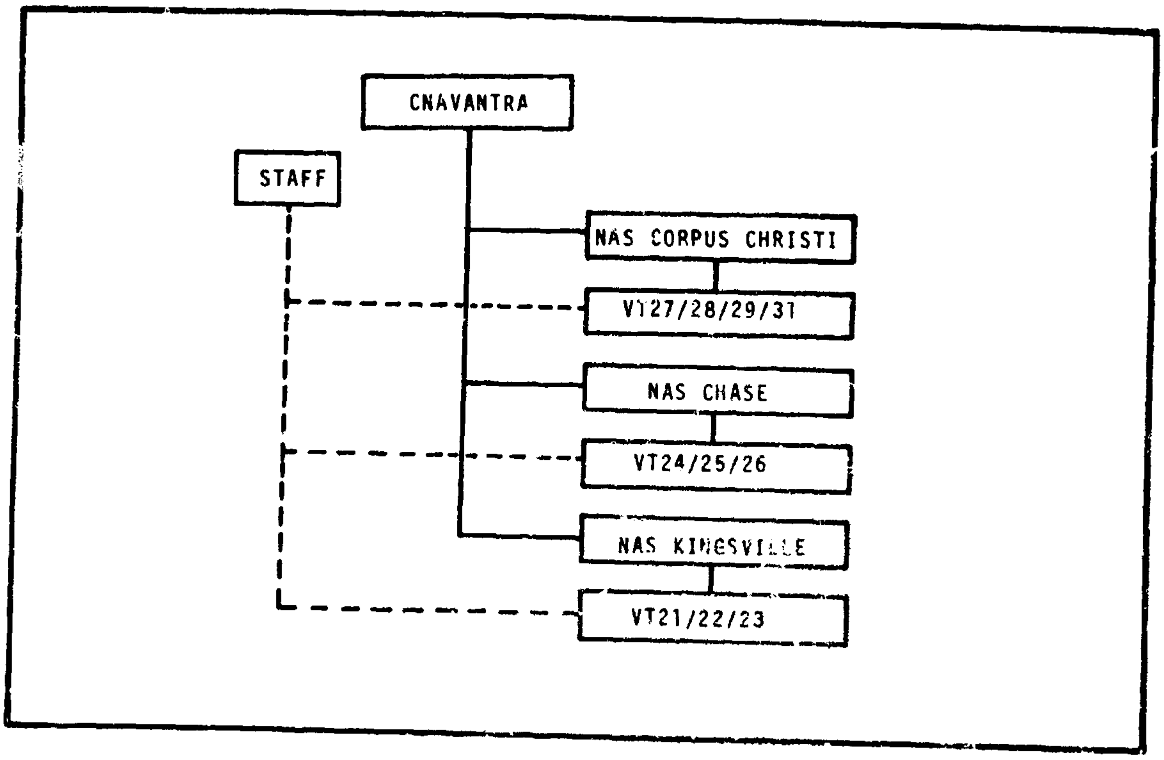

Figure 1-1. Principal Organization Elements of CNAVANTRA

PLAN OF STUDY FOR MAM

> The approach taken in the development of the MAM has involved an analysis of the pilot training process, setting up a production function, and then determining the least-cost mix of labor inputs to produce a specified pilot training output.

Improved Navy-wide source data collection systems, such as RMS PRIME, have made available a reliable and comprehensive data base.

Under this study, a structure of activity centers was developed from the RMS PRIME subcost center information. An intermediate product for each activity or subcost center considered was determined from RMS PRIME. An intermediate product is defined as a product of any subcost center which is consumed internally within the overall organization. These are the RMS work units for the particular subcost center. Process analysis, which deals with the formulation of interrelationships among these subcost centers (within the context of the overall pilot training objective) was then performed for each station. Programs were developed to describe the process analysis for the three naval air stations and to provide data in a format suitable for a linear programming (optimal/least-cost) solution.

In formulating the linear programming problem for the MAM, a linear relationship was assumed between variable labor inputs, intermediate products (work units), and final products (trained pilots). The purpose of the linear program was to obtain a least-cost set of labor inputs subject to constraints. The objective function is the total cost of labor necessary to maintain a specified pilot training rate. Examples of constraints considered in this study are:

1) Policy constraints (e.g., a certain percent of labor inputs must be stated).

2) Upper and lower bounds (e.g., each station will have a given number of general, "G", billets for ship-shore rotation).

3) Non-negativity (e.g., all amounts and costs of labor must not be negative).

4) Distribution (e.g., the appropriate distribution of intermediate products among subcost centers).

The complex CNAVANTRA system of interrelated cost centers is represented by a system of linear equations and inequalities. The result of this analysis is the selection of the "best" processes for securing efficient utilization of resources within the imposed constraints.

In order to develop the model for forecasting manpower requirements, it was, therefore, necessary to include in the study:

1) The development of linear functional relationships between specific labor technologies and intermediate products with respect to the required pilot training rates.

2) The aggregation and synthesis of these relationships, within the framework of process analysis, to a manpower allocation model that specifies the optimal mix of manpower over time to achieve specified output levels within stated or explicitly assumed policy and environmental constraints.

3) Constraints on basic manpower resources available to CNAVANTRA.

In developing the model, RMS PRIME data has been used to provide cost and resource (manpower utilization) data. This general framework of the manpower allocation model was developed using RMS PRIME 7000-8 and 7000-9 data.

> At different levels of command, different types and amounts of information are required. The PMM produces detailed productivity measures at the lower levels where the detailed RMS PRIME data is gathered. It also synthesizes these measures to provide high level commanders with the meaningful overviews.

Regular and timely reports on productivity levels and trends are needed at all levels for effective management, planning, and allocation of the limited resources available. However, the need for, and scarcity of, meaningful productivity measures is especially acute at the high levels of command. The detailed information which is collected by the RMS PRIME system for each cost and subcost center is generally most useful to the lower level commanders. From their detailed knowledge of an individual center's situations, they can almost intuitively judge its productivity. Higher level commanders require that large amounts of detailed information be synthesized to give an overall analysis of the command. Since the timeliness of a report affects its usefulness, the computer program system to implement the PMM is designed to facilitate the application of RMS PRIME data to the model and to speed productivity reporting.

The PMM for CNAVANTRA forms a variety of productivity measures tailored to the needs of managers at each level of command. From the basic RMS data for individual subcost centers, the PMM forms productivity measures which are then aggregated to successively high levels.

For each subcost center in CNAVANTRA, the productivity measurement model forms two conventional productivity measures: output per manhour and output per labor dollar (see Figure 1-2). The output per dollar is then divided by the standard for the subcost center to form a productivity index.

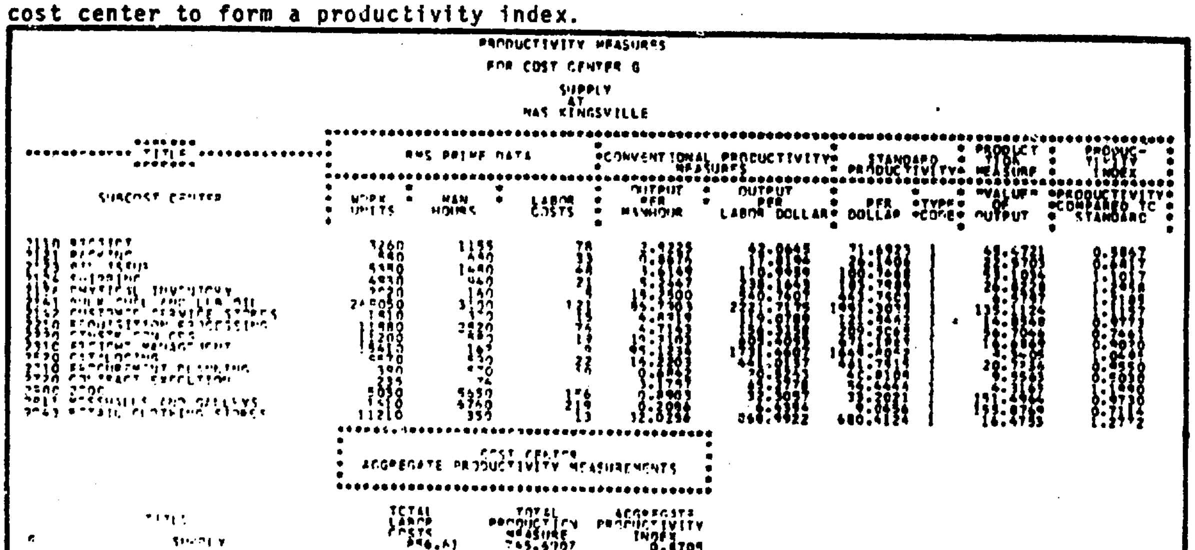

Figure 1-2. Sample Printout of Cost Center Aggregate Productivity Measurements

Since each subcost center's productivity index (PI) is formed by comparing its actual productivity with its own standard, the PI is normalized. They can then be meaningfully compared both horizontally among similar subcost centers at different bases, and vertically among different subcost centers at the same base.

The productivity measures, and the data used to form them, are printed out for each subcost center in a cost center. Then the PMM forms an aggregate productivity index for the cost center. This aggregate productivity index is formed by dividing the total labor cost for the cost center into a measure of the total value of the output of that cost center. This value of output (analogous to a "transfer value" in economist's terminology) is titled Production Measure in the PMM printout. The printed value is derived by multiplying the number of work units produced in each subcost center times the standard cost of these work units (i.e., the inverse of the standard output per labor dollar).

For each command, the PMM reprints the productivity indices of the subordinate cost centers and forms an aggregate productivity index for the command by comparing the sum of the labor costs to the sum of the production measures (see Figure 1-3). Similarly, the PMM forms an overall productivity for CNAVANTRA (see Figure 1-4) and also reprints the productivities of the subordinate commands.

COMMAND
AGGREGATE PRODUCTIVITY MEASUREMENTS

TITLE	TOTAL LABOR COSTS	TOTAL PRODUCTION MEASURE	AGGREGATE PRODUCTIVITY INDEX
COMMAND AND STAFF	139.86	135.6161	0.9698
COMPTROLLER	[illegible]	124.8413	1.6648
INDUSTRIAL RELATIONS	41.70	47.5771	1.1397
ADMINISTRATION	634.67	613.3093	0.9534
DATA PROCESSING	81.60	84.5747	1.0369
SUPPLY	884.41	759.4907	0.8707
AIRCRAFT MAINTENANCE	971.46	1075.6057	1.1341
MEDICAL AND DENTAL	456.00	429.5541	0.9442
SECURITY	96.70	54.1099	0.5595
OPERATIONS	1109.10	2397.0299	2.1120
TRAINING	324.00	341.3521	1.0571
NAS KINGSVILLE	4691.77	6668.9711	1.4219

Figure 1-3. Sample Printout of Command Aggregate Productivity Measurements

MAJOR COMMAND
AGGREGATE PRODUCTIVITY MEASUREMENTS

TITLE	TOTAL LABOR COSTS	TOTAL PRODUCTION MEASURE	AGGREGATE PRODUCTIVITY INDEX
NAS CORPUS CHRISTI	9590.96	8872.0734	0.9009
NAS CHASE	5427.37	6395.6451	1.1979
NAS KINGSVILLE	4691.77	6668.9711	1.4215
CNAVANTRA SQUADRONS	26669.49	24256.0920	0.9148
CNAVANTRA COMMAND	46449.19	45162.7227	0.9723

Figure 1-4. Sample Printout of Major Command Aggregate Productivity Measurements

SECTION 2

MANPOWER ALLOCATION MODEL

DESCRIPTION

DATA SOURCES

A valid and substantive base of data was required for the modeling effort. A variety of sources were utilized in the development and verification of such a base.

The basic sources of data for the development of the Manpower Allocation Model were RMS PRIME 7000-8 and 7000-9, OPNAV 5320 (Manpower Listings), NAVCOMP MANUAL VOLUME II, and Student Training Progress Critiques. This information was available for each of the three air stations under the cognizance of CNAVANTRA. How the data reflected the management of activities within CNAVANTRA was verified by interviews with personnel at the air stations. The available data, and on-station interviews, provided the insight necessary for the process analysis phase of the model development.

The definition, function, and associated work units of all subcost centers for the naval air stations were obtained from NAVCOMP MANUAL VOLUME II and CNAVANTRA Notice 7700 of 5 June 1969. The work unit for a subcost center was then considered as the intermediate product (defined in Section 1) associated with the subcost center. The process analysis phase of MAM development included the specification of the linear relationships among subcost centers in order to represent the distribution, internal to a particular naval air station, of the intermediate products.

RMS PRIME data contains total military and civilian manhours expended and, therefore contributes little to a breakdown of labor requirements by skill level and category. All labor requirements data for CNAVANTRA were obtained from one or more of the following sources:

1) OPNAV-5320
2) Manpower Authorization, OPNAV Form 1000/2, Rev. 2-68
3) Enlisted Distribution and Verification Report, BUPER Report 1080-14
4) Naval Personnel Research and Development Laboratory.

A breakdown of labor hours related to skill level and labor category was obtained from these sources, and labor inputs (both military and civilian) were costed according to the latest pay rate figures that existed for 1968.

The on-board manpower assignments for each air station is contained in the current manning document, OPNAV-5320. Some problems existed, however, in generating the labor requirements data for the training squadrons at each of the air stations. Each training squadron consists of four subcost centers:

1) Command,
2) Administration,
3) Training,
4) Maintenance.

Data on enlisted labor assignments for these subcost centers was interpreted directly from the Enlisted Distribution and Verification Report, when available. This report was not available for Training Squadron VT22 at NAS Kingsville, and the data for this squadron was, therefore, obtained from the Manpower Authorization from the same document. The distribution of personnel to specific subcost centers within Training Squadrons VT24, VT25, VT26, VT27, VT28, VT29 and VT30 was also formulated and coded. This information does not appear on either the Verification or Authorization Reports. This same information was generated for Training Squadrons VT21, VT22, and VT23 by using, as the determining factors, billet titles and series codes.

Officer labor requirements data was provided in machine readable form. This data, however, did not match certain code allocations determined for enlisted personnel. For example, officer flight instructors were coded as being assigned to Subcost Center 20 (Administration). These officers have been allocated to Subcost Center 30 (Training). Also, the data indicated that no officers were assigned to Subcost Center 40 (Maintenance), although billet title information indicated there were, in fact, maintenance officers. Other similar data problems of this nature were encountered and resolved.

The data on the production of trained pilots (Final Products) from CNAVANTRA was obtained from the following sources:

1) Student Training Progress Critique, CNAVANTRA 1500/44, Rev. 5-58.
2) Naval Air Advanced Training Statistical Summary, CNATRA Form 1500/10, Rev. 7-65.
3) Naval Personnel Research and Development Laboratory

The information obtained from these sources for each squadron included weekly data for:

1) The average student load.
2) The number of entering students.
3) The cumulative total of the number of students completing training.
4) The number of students completing training.
5) The number of students currently enrolled in refresher courses.
6) The number of student aircraft hours.

The Manpower Allocation Model is based on an accounting structure derived from a definitive base of RMS PRIME data.

The structure included in the RMS PRIME data is the basic structure for determining manpower requirements in support of a given pilot training rate for each naval air station of CNAVANTRA. The RMS PRIME data is organized by cost and subcost center (i.e., personnel at a particular air station are grouped into cost and subcost centers as a function of the products provided and services performed by the personnel). Personnel providing a particular product or service related to the pilot training process are assigned the same subcost center. These products and services then become the intermediate products associated with the subcost centers. These subcost centers are then considered as the entities within a naval air station for which manpower requirements must be obtained. This accounting structure is illustrated in Figure 2-1.

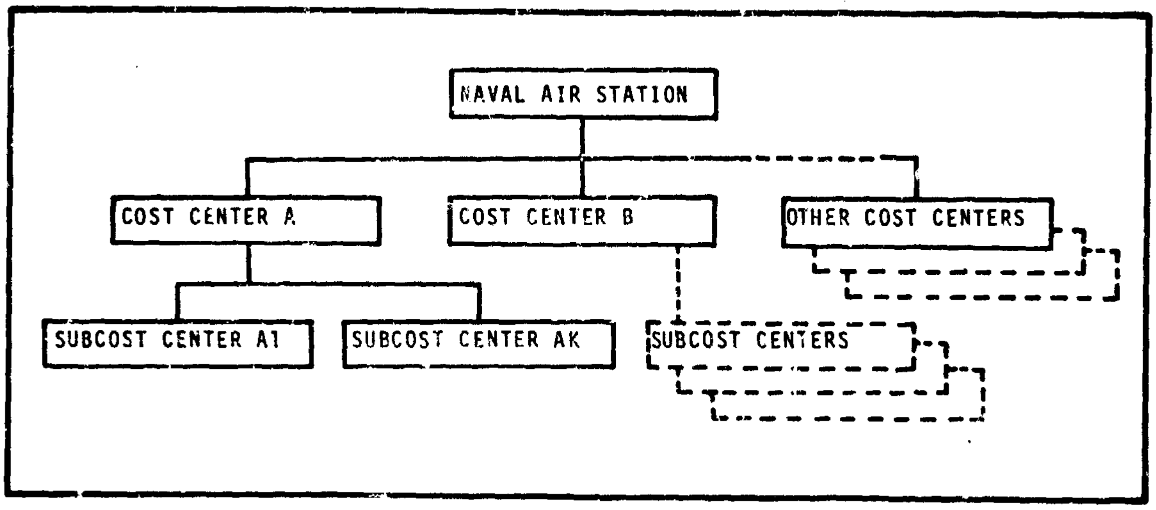

Figure 2-1. Cost-Subcost Center Structure

The accounting structure in the RMS PRIME data does not consistently parallel the command structure of an air station. The command structure is, of necessity, concerned with a rigid chain of command. A typical command structure is illustrated in Figure 2-2. In the command structure, the air station personnel are assigned to departments where each department has a specific objective, and the orderly flow of goods and services from one department to another is the responsibility of the Command and Executive Offices. As indicated in Figure 2-2, departments may be broken into divisions, which again may be broken into branches, with a chain of command always flowing from top to bottom in the Figure. Each department contains, as part of the command structure, a department head or Officer in Command.

In the RMS PRIME data, each department of the command structure is designated as a cost center. However, the subcost center accounting structure does not distinguish, in a "chain of command" sense, between divisions and branches of a department. If a division contains no branches, the division may be designated as a subcost center. If a division is broken into branches, the branches are designated as subcost centers. However, it is possible, in the RMS PRIME data, for more than one branch of a division to be grouped into one subcost center. It is also possible for a branch or a division to be broken up into more than one subcost center.

An accounting structure, as modeled, facilitates a more accurate rendering of work units, specific tasks, and skill level requirements. It permits a cost accountable interrelationship of activities and functions not always apparent or discernable in a command structure. More importantly, it permits the application of objective and quantitative techniques in manpower optimization, yet remains sensitive to policy constraints imposed by manpower planners and managers.

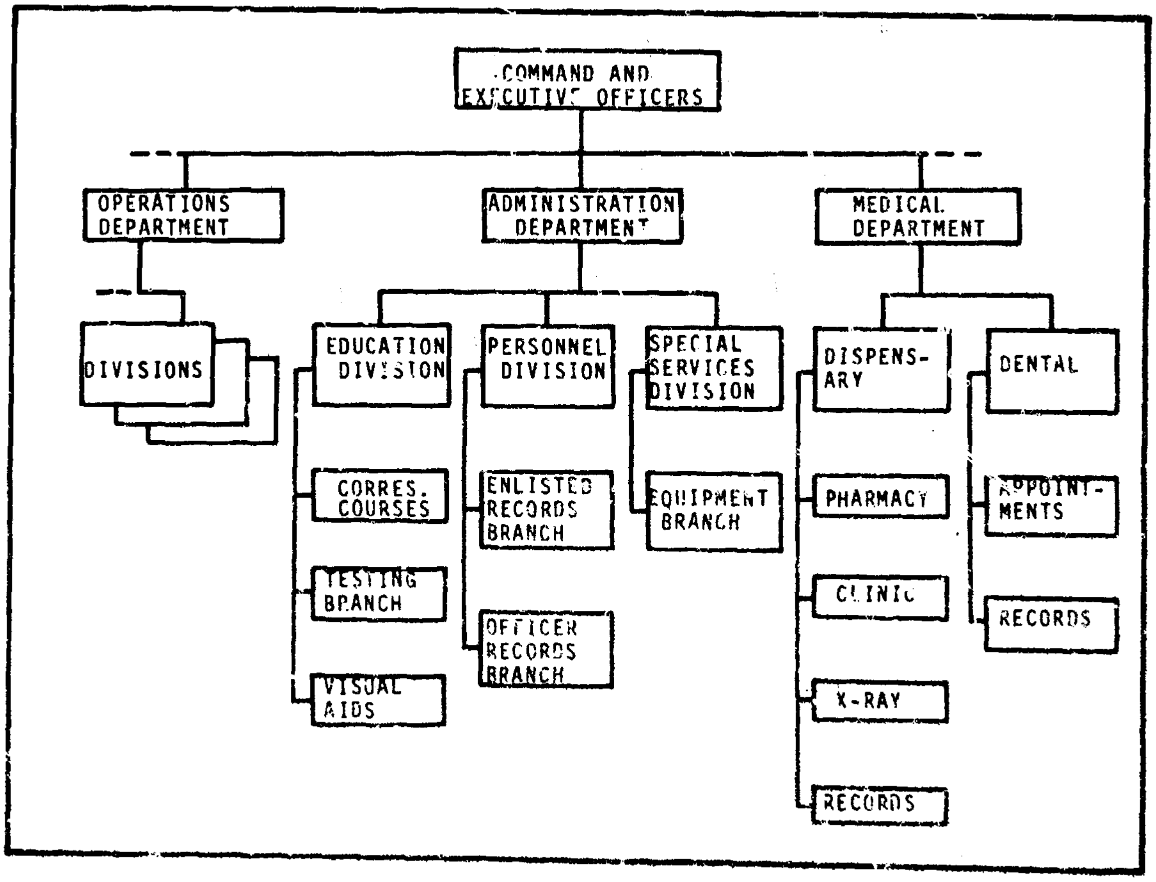

Figure 2-2. Typical Command Structure

STUDENT FLOW

CNAVANTRA receives its inputs (student pilots) from CNABATRA activities. The output of trained pilots from CNAVANTRA is a function of type and length of training and attrition within each training squadron.

Two types of final products (trained aviators) are produced at CNAVANTRA: Jet Pilots and multi-engine Prop Pilots. Advanced Prop training is provided in one of the training squadrons (VT27, VT28, VT29, and VT31) at NAS Corpus Christi. Advanced Jet training is obtained in one of the training squadrons (VT24, VT25, and VT26) located at NAS Chase or VT21, VT22, and VT23 located at NAS Kingsville. All advanced Prop input into CNAVANTRA comes from VT5 at NAS Saufley, and all Advanced Jet input comes from VT4 at NAS Sherman. Upon completion of courses in CNAVANTRA, students have finished the formal phase of pilot training.

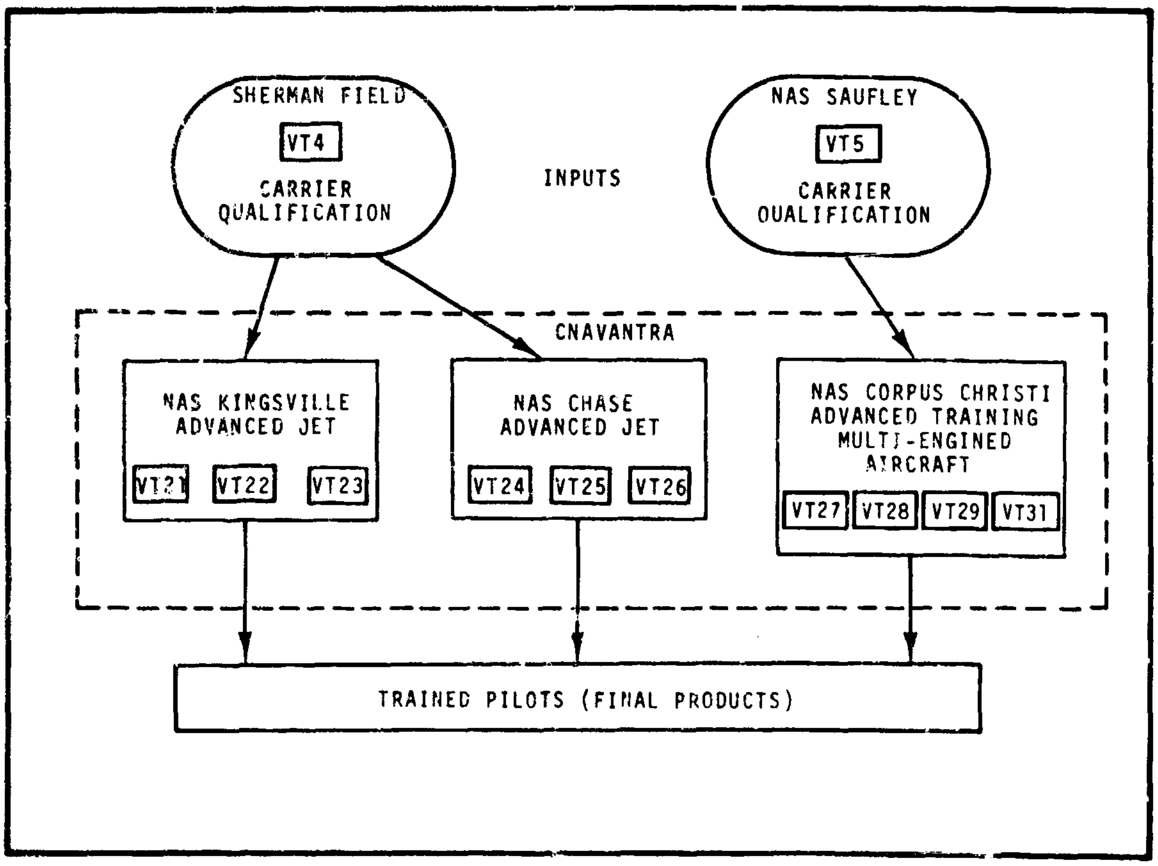

Figure 2-3. Student Flow for CNAVANTRA

DISTRIBUTION OF INTERMEDIATE PRODUCTS

> Intermediate products are distributed to various cost centers on a basis of the interrelationship of the cost centers and associated rules of product consumption.

Intermediate products data was obtained from RMS PRIME. This data base contains only information on the production of intermediate products and nothing about consumption patterns of goods and services. The interrelationship between cost centers was subsequently established through detailed investigation, and a process analysis was developed for each work unit. The only cost centers modelled were those for which work units data was available from RMS, and those for which labor assignments could be made on the basis of OPNAV 5320.

The identification and distribution of intermediate products is the key part of the modelling effort. The end result is a representation of the complex interrelations between all the cost centers. For example, the "output" of the General Mess (food service) is the intermediate product "number of meals served", and is distributed to all other cost centers at the station in proportion to the military personnel assigned to these other cost centers. On the other hand, the "output" of the Airframes subcost center in the Aircraft Maintenance Department is the intermediate product "number of airframe work orders completed" and is distributed to Cost Center P (Operations) and the cost centers representing the particular training squadrons in proportion to the number of flight hours.

The distribution of every intermediate product for each subcost center modelled was considered. The result of this work is presented in a following section. Each subcost center is identified by name and RMS PRIME code with work units (output) also being given. The nature of the intermediate product was considered in the determination of distribution rules. Those cost centers whose outputs were determined not to vary with the pilot training rate were not included in the process analysis. These cost centers are refered to as throughput cost centers.

It is clear that throughput cost centers consume goods and services. It was assumed that a negligible amount of intermediate products were consumed by throughputs and, hence, the percentages used for distribution were computed exclusive of throughput labor. Although this assumption is thought to be valid, the consumption of appreciable amounts of an intermediate product by throughputs can be modelled by the inclusion of a lower lower bound on the right hand side of the linear programming formulated production and consumption. This is, in effect, a statement that at least some number of products must be produced for the throughput cost centers.

ANALYSIS RESULTS

A process analysis approach was used to model alternate modes of production. It simultaneously considers a large number of interconnected partial production functions for each activity of CNAVANTRA.

Process analysis has the capability of considering alternate modes of production. In a complex organization such as CNAVANTRA, this approach considers a large number of interconnected partial production functions to determine a least-cost labor mix. Certain specific tasks are inherent in the development of a process analysis model:

1) Development of an exhaustive list of processes employed.
2) Identification of inputs and outputs for each process.
3) Determination of relationships (linear) between inputs and outputs.

The results of such analysis are discussed in the following sections. This process analysis provides a comprehensive look at the structure of each of the three CNAVANTRA bases modelled.

The form and operation of the models are identical. The principal difference arises in the need to specify precisely the different "processes" and their unique interrelationships at each of the activities modelled. This is the essence of the process analysis approach. That is, the methodology is general, but the specification and interrelationship of inputs, intermediate products, and final outputs for each facility is unique to that facility.

Details of the analysis are to be found in Section 6, Process Analysis, where results are presented for each of the three separate models.

IDENTIFICATION OF INPUTS

Inputs to each naval air station of CNAVANTRA are of two general types; pilot (student) input and labor input.

Pilot inputs are not accounted for as "free goods", but are costed in the model objective function as paygrade O1 (Ensigns). The quantities of pilot inputs required are based on the overall training requirements and a student pilot attrition rate.

The categories of labor inputs at the naval air stations of CNAVANTRA include, for example: Officers and warrant officers, graded and ungraded civilians, and rated and non-rated enlisted men. These labor inputs were costed in accordance with DoD Instruction 7220.25, "Standard Rates for Costing Military Personnel Services", 1 August 1968, and DoD Instruction 7041.3 of 26 February 1969. They were then distributed to the various cost centers at the stations, and in the squadrons, in fixed proportions based on the manpower listings provided. Since these listings were for one point in time only, the interchangability of various labor categories over time was not made explicit for this particular application of the model. Thus, it was not possible to modify the fixed proportions of labor inputs specified for any given cost center.

Labor inputs are further classified as variable labor input or as "throughputs". That is labor assigned to cost centers included in the process analyses or to throughput cost centers. A "throughput" by definition is a cost center whose manning requirement remains at a constant level for the training rates under consideration.

The MAM is designed to only address the problem of optimizing the required variable labor inputs. For purposes of providing a complete manning document for each activity; however, throughputs are printed out along with the optimized variable labor inputs.

Specific identification of the general inputs is contained in the models and in Section 5, Model Inputs.

DEFINITION OF RULES AND PRODUCTS

Tenant activities and throughputs were identified and incorporated into the model with special relationships and constraints. The nature of the intermediate product was considered in the determination of distribution rules.

Tenant activities and throughputs are defined as activities of an air station that do not contribute to the pilot training process. However, they consume intermediate products of cost centers that are related to the pilot training process. Manpower requirements for tenant activities and throughputs and their consumption of intermediate products are independent of the pilot training rate, however. The significant difference between tenant activities and throughputs is that throughputs are air station activities that are ordinarily part of the air station structure while tenant activities are not. An example of a tenant activity is the Army unit located at NAS Corpus Christi, and an example of a throughput activity is the Cost Center N (Security). A complete list identifying the tenant activities and throughputs for the three naval air stations of CNAVANTRA is included in Section 6.

Once the tenant activities and throughputs were identified, they were not included in the model as individual activities; however, their consumption of intermediate products was included in the model as explained below.

The linear program formulation of the Manpower Allocation Model is briefly described in Section 1 of this report. This includes linear relationships and constraints which represent the distribution and consumption of intermediate products among the various cost centers. It is through the use of these constraints that the influence of the tenant activities and throughputs is included in the model.

When the number and types of personnel at the tenant activities and throughputs were determined, the distribution functions for the consumption of intermediate products (contained in Section 6 of this report) were used in order to determine what the consumption of intermediate products was for each activity. Assuming that these activities did not contribute to, or influence, the pilot training rate, the amount of intermediate products consumed for these activities was then entered into the model as a lower bound for the output and consumption of the intermediate products for the appropriate cost centers. In this way, each cost center included in the model is required to produce an initial amount of output which is equivalent to the total amount of the output consumed by all of the tenant activities and throughputs. It is at the same time required to produce a minimum amount of output which is the total amount of output consumed by all of the tenant activities and throughputs plus the total amount of output consumed by all other cost centers.

For example, consider in particular the mess hall facilities at NAS Corpus Christi, Subcost Center 9911. The work unit or intermediate product for this subcost center is the number of meals served. If it can be determined (for the time period under consideration in the model) that the tenant activities and throughputs consume four thousand meals, then the output of Subcost Center 9911 must be greater than, or equal to, the number of meals required by all cost centers included in the model, plus the four thousand meals consumed by the tenant activities and throughputs.

In the process analysis phase of model development, no information was obtained on the tenant activities of NAS Chase and NAS Kingville. Consequently, the consumption of intermediate products by the tenant activities for these stations was not included in the model.

A list of the tenant activities for NAS Corpus Christi and the amount and type of intermediate products consumed by these activities is included in a following section.

STRUCTURE OF MANPOWER ALLOCATION MODEL (MAM)

> MAM is structured to minimize total manpower cost to attain a specified output level. An understanding of the mathematical and logical structure of the MAM will assist the user in operating and modifying the model.

The MAM is structured so that by varying the level of desired output (trained pilots) and stating pertinent constraints, it is possible to compute the least-cost mix of manpower inputs required.

Before further describing the mathematical form of the model, certain notations are defined:

x_i - ith labor input classified by skill category and level in units of manpower per month

z_i - ith final output item classified by level of pilot training achieved in units of number of pilots per month

Y_i - ith intermediate product classified by the producing cost center and the consuming cost center in work units per month

c_i - cost of the ith labor input (x_i) in dollars per manhour

W - a column vector of activity levels; each cost center is run at some activity level in each technology period

X - column vector of labor inputs; i.e., $\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}$

Capital letters are used to represent vectors of quantities (for example, the x_i's and z_i's)

A - technological matrix whose entries (technological coefficients) are related to partial productivities and reflect the operation doctrine/organization of a cost center.

Process analysis is used to describe the flow of inputs and outputs to and from the various cost centers. The rules by which these products have been distributed for NAS Corpus Christi, Chase and Kingsville are described in the discussion of process analysis. With the structure provided by process analysis, the manpower allocation model is designed to minimize the total cost of the variable labor inputs ($\Sigma c_i x_i$) subject to certain constraints. These constraints are as follows:

1. Outputs $\geq$ specified level
2. Policy constraints on labor utilization
3. Upper and lower bounds on variable labor inputs
4. Non-negativity constraints on variables

In more mathematical terms, the model becomes:

Minimize: $$C^T X \tag{1}$$

Subject to: $$Z \geq K_1, \tag{2}$$

$$AW = \begin{bmatrix} Z \\ Y \\ X \end{bmatrix} \tag{3}$$

$$K_2 \leq X \leq K_3 \tag{4}$$

and $$W, X, Y, Z \geq 0 \tag{5}$$

where:

C and X are column vectors (C^T is the transpose of C)
A is an $N \times m$ technological matrix
K_1 is a column vector of required outputs
K_2 and K_3 are lower and upper limits on labor inputs
W is an $m \times 1$ column vector of activity levels of subcost centers
Z is a column vector of n_z outputs
Y is a column vector representing n_y intermediate products
X is a column vector of n_x variable labor inputs

Note that $N = n_z + n_y + n_z$. Here, m is the number of distinct technologies or means of operating and organizing subcost centers.

The model formulation by equations (1) through (5) contain both X and W as unknowns.

The model solution is obtained by a linear program and is expressed in terms of activity levels of the various cost centers as follows:

$$AW = \begin{bmatrix} A^{(1)} \\ A^{(2)} \\ A^{(3)} \end{bmatrix} \qquad W = \begin{bmatrix} Z \\ Y \\ X \end{bmatrix} \tag{6}$$

where $A^{(1)}W = Z$, $A^{(2)}W = Y$, and $A^{(3)}W = X$. The linear program problem becomes: Find values for the elements of W which minimize:

$$C^T A^{(3)} W \tag{7}$$

subject to the following constraints:

$$A^{(1)}W \geq K_1 \tag{8}$$

$$A^{(2)}W \geq 0, \tag{9}$$

$$K_2 \leq A^{(3)}W \leq K_3, \tag{10}$$

and

$$W \geq 0. \tag{11}$$

Equations (7) through (11) express the linear programming problem for the vector W of unknown activity levels. The values of the elements of the optimal activity-level vector, $\hat{W}$, are determined by using the well-known simplex method of linear programming. The optimal manning requirements (except for throughputs or fixed labor inputs) are then calculated by:

$$\hat{X} = A^{(3)}\hat{W}, \tag{12}$$

where $\hat{X}$ is the vector of labor inputs at optimal manning.

The mathematical structure of the model is based on linear relationships between the cost/subcost centers and determining optimal activity level vectors subject to quantified constraints.

The simplex method is based on the fact that, if there are m constraints (or rows) in the constraint matrix, and these are linearly independent, then there is a set of m columns (variables or vectors) which are also linearly independent. Hence, any Right Hand Side (RHS) can be expressed in terms of these m columns (called a basis). The simplex method uses these basic solutions, stepping from one to another (by exchanging one column in the basis with one column not in the basis on each step or iteration) until a solution (called a basic feasible solution) is obtained that satisfies all of the constraints and the requirement that all the column values be non-negative.

After a basic feasible solution is found, the simplex method steps along, examining a series of basic feasible solutions to find one that satisfies the requirement that the value of the functional (or objective) row be a maximum or minimum (the optimal solution). For the MAM, the objective function is in mathematical terms: Minimize $C^TA^{(3)}W$. Not all LP problems have an optimal solution. If there is no solution in non-negative variables, or none that keeps the variables within their specified bounds, the LP problem is said to be <u>infeasible</u>. If a feasible solution is found, but the constraint rows do not confine the value of the functional row to finite values, the LP problem is said to be <u>unbounded</u>.

REFERENCES

a. *Mathematical Programming System/360 (360A-CO-14X) Linear and Separable Programming - Users Manual*, IBM.

b. *Manpower Allocation Model*, Volume 1, Final Report, Contract N00022-69-C-0076, Mellonics Systems Development Division, May 1969.

c. *Mathematical Programming System/360 (360A-CO-14X) Control Language - Users Manual*, IBM.

PROBLEM AREAS

> The problems encountered in the process analysis phase of model development were basically related to the modeling of cost centers and the distribution of intermediate products.

The following paragraphs identify the problems encountered and include the methodology and the assumptions which were employed in order to complete the modeling of the air stations of CNAVANTRA.

The first problem encountered involved the computer facility as a subcost center at NAS Corpus Christi. Each of the three naval air stations has a data processing subcost center whose intermediate product is keypunched computer cards. These cards are, however, "consumed" only by the computer facility at NAS Corpus Christi. In the analysis of other CNATRA facilities it was found that each facility could be treated as a separate and individual entity within a command (i.e., the Manpower Allocation Models are not aggregated for a command). This is an appropriate and feasible modeling methodology as long as the distribution and consumption of intermediate products does not tie together subcost centers from different air stations. When, as in this case, several air stations are related because of the link between subcost centers at different air stations, the influence due to this link upon the value of the objective function must be considered. In this particular case, the manpower requirements for the computer facility at NAS Corpus Christi will depend not only upon the keypunched card output at NAS Corpus Christi, but also upon the keypunched card output of the data processing subcost centers at NAS Chase and NAS Kingsville.

The essence of the problem then, is that the manpower allocation analysis for NAS Corpus Christi cannot be performed until the level of keypunched card output from NAS Chase and Kingsville has been determined or assumed. When this level has been established, it can then be used as a lower bound on the output of the computer facility subcost center at NAS Corpus Christi. It is used in the model in the same fashion as the tenant activity and throughput lower bounds, which are explained elsewhere in this section.

A second problem arose during the process analysis when it was discovered that Cost Center P (Operations) had aircraft under control in addition to those assigned to the training squadrons. It was, therefore, necessary to distribute the intermediate products of subcost centers related to aircraft functions to the subcost centers of Cost Center P (Operations), as well as to the training squadrons by the percent of flight hours. The flight hours of military personnel who are assigned collateral shift duties in addition to their primary duties are reported by Subcost Center 6F20 (Flight Time). These reports are used as a basis to determine the percentage of consumption of intermediate products for aircraft-related functions by Cost Center P (Operations).

PILOT TRAINING RATE CONVERSION FACTORS

Conversion factors fix the final product output rates for the specific squadrons relative to the final product output ratio for the particular training program.

The range of final product output rate (FPOR), that is trained pilots, was specified for the advanced jet and prop systems of CNAVANTRA. This range to execute the model was derived from historical data. Conversion factors (ratio of squadron FPOR to the FPOR for the activity) were computed using the Student Training Progress Critique, Jan-Apr 1969, as a data base. The numbers of graduations were summed through the four months of data for each training squadron. Squadrons VT21, VT22, VT23, VT24, VT25, and VT26 were added together to obtain a system FPOR for advanced jet training squadrons VT27, VT28, VT29 and VT31 were added together to obtain a system FPOR for advanced prop. The conversion factors were then computed as the ratio of the squadron final product output rate to the training activity or system (advanced prop) final product output rate. The conversion factors for the advanced jet system and the advanced prop system must sum to 1.0 individually. The conversion factors given in Table I were derived from the available data and used in demonstrating the model.

Table I - Conversion Factors Used in Demonstrating Model.

Type of Training	Naval Air Station	Training Squadron	Conversion Factor
Advanced Jet	Kingsville	VT21	.213
		VT22	.203
		VT23	.180
	Chase	VT24	.128
		VT25	.138
		VT26	.138
Advanced Prop	Corpus Christi	VT27	.214
		VT28	.183
		VT29	.406
		VT31	.197

The models assume that pilots are trained at a constant rate throughout he year. The model could be made dynamic in this sense by the application of seasonal or cyclic variation analyses to account for "peaks and valleys" in training rates and resultant fluctuations in manpower requirements. In addition, the discrete, or "block", nature of the training syllabus could be accommodated in the model by segmentation of the process analysis and simultaneously applying different training rates for different segments of the process.

APPLICABLE CONSTRAINTS ON INTERMEDIATE PRODUCTS

Constraints on the production of intermediate products may be used to determine the manpower required to support tenant activities.

To illustrate the use of lower bound constraints, consider NAS Corpus Christi which hosts several tenant activities; specfically, these are the: 1) Army Unit; 2) Navy Hospital; 3) Coast Guard Detachment; 4) Naval Reserve Center; 5) 8th Naval District Print Shop; and 6) Law Center. These tenant activities consume intermediate products from the Security, Public Works, and Supply cost centers. The first two cost centers are throughputs and, thus, they are not recorded in the process analysis. Cost Center Supply contains six subcost centers which distribute intermediate products to the tenant activities. The lower bounds for these cost centers have been calculated as the product of the average number of work units produced by the subcost center during March and April, and the ratio of the number of people served at tenant activities to the total number of people served.

The specific lower bounds which were calculated for demonstrating the model were derived for the available data as follows:

Subcost Centers of Supply		Lower Bound	
Designator	Description	Value	Work Units
2330	Household Goods	1,100	Applications
2710	Procurement Plan	2,800	Procurement line items processed
2720	Contract Execution	1,400	Procurement actions processed
2310	Freight	940	Line items
9911	Mess Hall/Galley	47,000	Daily rations issued
9943	Retail Clothing	32	Volume at sales

Similar calculations were performed to account for the tenant activities at NAS Chase; namely, NALF Galiad, the Milan Targets, and NAS Kingsville, which hosts the Orange Auxiliary Landing Strip.

The data processing cost center at NAS Corpus Christi also services NAS Chase and NAS Kingsville. A lower bound must be placed on Subcost Center 1H30, ADP "Applications" to represent the flow of machine hours not consumed by NAS Corpus Christi. This lower bound was computed as the product of the average machine operating hours per month at Corpus Christi and the ratio of the average number of cards keypunched at Chase and Kingsville to the average number of cards keypunched at CNAVANTRA. Specifically, from the available data, the lower bound for the intermediate products at Subcost Center 1H30 is 4,000 equipment operating hours (the RMS PRIME work units for Subcost Center 1H30).

> The Manpower Allocation Model (MAM) output gives a detailed report of manpower requirements for each subcost center for specified pilot training rates (PTR's).

The output of the MAM is a computer listing of manpower requirements for specified PTR's. The output, which contains manpower requirements to support PTR's (e.g., 600-1800 pilots per year for advanced jet in increments of 400 and 360-1440 pilots per year for advanced prop in increments of 360) is organized for each of the three naval air stations as shown in Figure 2-4.

For each PTR, the first page contains the indication of the PTR (or FPOR) being examined. The FPOR for the system and the elements are included as shown in Figure 2-4.

```
**********************************************************
* OPTIMUM  COST  CENTER  MANPOWER  ALLOCATIONS            *
* ACTIVITY: 63376 CHASE                                   *
* SYSTEM ANNUAL FPOR:              140[illegible]         *
*                                                         *
* SA3C  ANNUAL SYSTEM ELEMENT      179                    *
* SO3C  ANNUAL SYSTEM ELEMENT      193                    *
* SP3C  ANNUAL SYSTEM ELEMENT      193                    *
**********************************************************
```

Figure 2-4. Sample Printout of FPOR Header

The MAM printout prescribes manpower requirements for overall CNAVANTRA pilot training rates for NAS Kingsville with VT21, VT22, and VT23; NAS Chase with VT24, VT25, and VT26; and NAS Corpus Christi with VT27, VT28, VT29, and VT31. Other PTR's may be defined to make the MAM output relevant to other areas by use of the BUPER program. A sample printout for NAS Chase is given in Figure 2-5.

```
                         OPTIMUM  COST  CENTER  MANPOWER  ALLOCATIONS
                         COST CENTER:    A  COMMAND & STAFF

SYSTEM ANNUAL FPOR:   1[illegible]                              OPTIMUM WORK UNITS
ACTIVITY: 6[illegible]376 CHASE                                 1A12          1384
                                                                1A3[illegible]   44[illegible]
                                                                1A4C          1[illegible]
                                                                9931          2957

              ***************************************************************
              *             MANPOWER REQUIREMENTS SUMMARY                   *
              *                                                             *
              *      MILITARY                    CIVILIAN                   *
              *                                                             *
              * OFFICER ENLISTED TOTAL   GRADED UNGRADED TOTAL   GRAND-TOTAL *
              *    12       16      28      12       0      12        40     *
              ***************************************************************

*********BILLET IDENTIFICATION*********  ****LABOR SKILL CATEGORY****  *****MONTHLY MAN-HOURS AND MANPOWER****
SUBCOST                                  NEC/                          HOURS     LEAVE AND      GROSS  MANPOWER
CENTER   *********POSITION TITLE*******  NOBC  SERVICE  SERIES  GRADE  REQUIRED  NON-AVAILABLE  HOURS  CIV  MIL
1A1[illegible]  COMMANDING                      O        131[illegible]
1A1[illegible]  EXECUTIVE                       O        131[illegible]
1A1[illegible]  AVIATION SAFETY                 O        131[illegible]
1A1X     INDUSTRIAL SAFETY INSP                 E        G
1A1[illegible]  DRIVER LICENSING & TRNG PO      E        G
1A1[illegible]  CHIEF MASTER-AT-ARMS            E        MA
1A1[illegible]  GENERAL SAFETY OFFICER          GS       018
1A1[illegible]  SECRETARY (STENO)               GS       318
1A1[illegible]  CLERK-TYPIST                    GS       322
1A3[illegible]  PUBLIC AFFAIRS                  O        11[illegible]
1A3[illegible]  PUBLIC AFFAIRS                  E        JO
1A3[illegible]  CLERK-TYPIST                    GS       322
1A4[illegible]  LEGAL                           O        1625
1A4[illegible]  CCO MESSENGER/DRIVER            E        G
1A4[illegible]  ACDO                            E        SF
1A4[illegible]  LEGAL                           E        YN
1A4[illegible]  CLOSED MICROPHONE REPORTER      GS       319
9931     CHAPLAIN                               O        410[illegible]
9931     CHAPLAIN ASSTS                         E        G
9931     CLERK-TYPIST                           GS       322
```

Figure 2-5. Sample Printout of Manpower Requirements Summary for a Given Cost Center

Cost Center - Provides the RMS PRIME cost center number and description (e.g., Cost Center A, Command Offices; Cost Center B, Comptroller, etc.). The report is organized by RMS cost center within each CNAVANTRA annual PTR.

System Annual FPOR - Lists the annual number of pilots in Advanced Jet and Prop Squadrons who should complete training at an activity.

Activity - Provides the name and accounting number of the naval air station for which manpower requirements are prescribed (e.g., NAS Chase (60376)).

Optimum Work Units - Provides the standard ("should be") level of output for all subcost centers that produce intermediate products consumed by other cost centers. Subcost centers whose output is consumed within the cost center (e.g., administration) do not appear in this list because they do not enter into the process analysis. These standard output values may be used to check actual performance (i.e., output at an operating PTR) in much the same way that a standard cost system is employed for management control purposes. These work units also provide the primary link in the integration between the PMM and MAM.

Manpower Requirements Summary - Indicates the requirements for each cost center by officers and enlisted men with subtotals, graded and ungraded civilians with subtotals, and a grand total of the number of persons needed at the cost center. Manpower requirements for a cost center or an activity may, therefore, be compared at increasing PTR's or across activities for similar cost centers at the same PTR.

Billet Identification - An input variable which provides the subcost center identification and title for each billet position (e.g., assistant legal officer, public affairs officer, clerk typist). Secondary NEC/NOBC are used if the billet identification was not provided.

Labor Skill Category - Provides, under the "service" column, the general labor classification ("O" for officer, "WO" for warrent officer, "E" for enlisted men, "GS" for graded civilians and "WG", etc., for ungraded or wage board civilians). The column labeled "Series" indicates the appropriate designator for officers, the rating for enlisted men, and the series for civilian personnel. Where appropriate, based on input data, the primary NEC/NOBC also appears to further identify the particular labor skill category for billet assignment purposes. The rank, rate, or grade is also listed to indicate the proficiency level of the labor skill.

Monthly Manhours and Manpower - Provides the total manhours per month and the equivalent number of people in each labor skill category required in the cost center. The "Hours Required" column shows the required productive manhours per month for the skill category and level to support the indicated system PTR. The "Leave, Non-Available" column shows the non-productive manhours allowed each month for the skill category and level. There are minimum allowances for each labor type, but the numbers that appear may be greater than the minimum. However, the rounding procedures minimize the amount of this type of time for each series. The "Gross Hours" column shows the sum of "Hours Required" and "Non-Available" columns and represents the leave equivalent/total number of hours required each month. The "Total Manpower" column shows, separately, the total number of civilians and military required by skill category and level.

The last page of the requirements for the PTR contains a summary by officer, enlisted and civilian, graded and ungraded. A sample of this printout is shown in Figure 2-6.

```
*****************************************************************
*   TOTAL MANPOWER REQUIREMENTS SUMMARY FOR FPOR:   140(        *
*                                                               *
*      MILITARY                     CIVILIAN                    *
*                                                               *
* OFFICER ENLISTED TOTAL   GRADED UNGRADED TOTAL   GRAND-TOTAL  *
*    391     269'   3081     276     178    454        3535     *
*****************************************************************
```

Figure 2-6. Sample Printout of Total Manpower Requirements Summary for a Given FPOR

ADDITIONAL MODEL OUTPUT

> In addition to the principal output of the MAM, a listing by cost center of the least-cost manpower requirements necessary to support a specific output training rate, additional output is available to the manpower requirements analyst.

In addition to the manpower requirements, other information of a more analytic nature is available from the linear programming techniques. This information provides insight into the model structure of labor utilization and constraints and consists partially of the following:

1) values of dual variables;
2) values of slack variables;
3) ranges of student training rates for which labor is linear; and
4) labor cost changes which necessitate process substitution.

The values of the dual variables (also referred to as internal opportunity costs or shadow prices) are available from the linear programming computer output. These variables are numbers which represent the effect (value) of the constraints (right hand sides) on the objective function (least-cost labor mix cost) at the optimum. Mathematically, they are the rates of change of the objective function with respect to the right hand sides of the constraint relations evaluated at optimality. There is a unique dual variable corresponding to each of the constraint relations.

These dual variables have a further important economic interpretation, namely: Those products for whom the corresponding dual variables are equal to zero are <u>free goods</u>, in that some small additional amount of them may be used without increasing the cost of running the base. Otherwise, they represent the <u>unit cost</u> as represented by increasing the total base operating cost of requiring a small additional amount of some product. For example, if there is excess supply over demand for a product, this excess is a free good in that it doesn't involve any additional cost to use it. On the other hand, for a product (either intermediate or final) for which supply just equals demand, it will require operating some cost centers at higher activity levels to make more of this product available. Hence, there is a cost associated with the constraint on the goods. The general principle is that there are positive internal opportunity costs for those products for which the constraints (greater than or equal to) are binding. This is referred to as <u>complementary slackness</u> in mathematical programming.

Associated with each product (final or intermediate) is a slack variable. Corresponding to each product is an equation or inequality. The value of this variable represents the excess of production over consumption, and this quantity is non-negative. Thus, the value of the slack variable represents the amount of "fat" in the system.

It will be positive for free goods and, as discussed above, is intimately connected with the dual variables. Mathematically, a constraint is binding when the associated slack variable is zero.

Items (3) and (4) above are obtained by what is referred to as parametric linear programming. This is not currently part of the linear programming output. To obtain such information, the proper computer commands must be added to the MPS part of the data processing system. This is not envisioned as a major computer programming task.

By use of parametric linear programming (a standard part of the Mathematical Programming System (MPS) of the IBM 360/67 computer), it is possible to determine the ranges of student training rates where labor demands are linear. This may be analyzed for both individual cost centers or an entire facility. This technique may also be used to investigate the impact of labor cost changes on optimal manning requirements. The obvious impact is that if individual costs go up, so will the total cost of running a base. However, it is possible that costs can change in such a way that the manner in which a cost center is organized/operated will have to be changed.

SECTION 3

PRODUCTIVITY MEASUREMENT MODEL

DESCRIPTION

> The Productivity Measurement Model uses monthly RMS PRIME data to form a variety of measures which are aggregated to successively higher levels.

The RMS PRIME data, used as inputs for the Productivity Measurement Model (PMM), is shown in Figure 3-1. For each subcost center and time period covered, the inputs are:

1) number of work units performed or accomplished;
2) number of productive military and civilian labor hours expended;
3) amount of military and civilian labor dollars expended.

This data is directly available from the RMS PRIME 7000-3 reports. The military and civilian labor hours and labor dollars are summed in the program to provide the model with total labor hours and total labor dollars for each subcost center by time period.

Conventional productivity measures which are the unweighted ratio of output (in work units) divided by input (in dollars or manhours) are computed directly from the RMS PRIME data. Since these conventional productivity measures have no normalizing criterion, they generally cannot be meaningfully compared either horizontally, among subcost centers performing similar functions, or vertically, among subcost centers performing dissimilar functions.

The PMM forms a standard productivity measure ($SPM_\$$) by dividing the cumulative total work units produced in the subcost center by cumulative total labor costs (Figure 3-1). This standard (the cumulative average productivity measure in dollars) is automatically updated by the program.

The use of the cumulative average of past productivity measurements as a standard (historical) has the advantage that it smooths out fluctuations in the monthly data. An alternate method of computing a historical standard is to determine a moving average. Still another type of standard is the engineered standard. Data for this type of standard is not available in RMS PRIME reports, but can be obtained from work sampling data, 3M data, or other technical sources.

The productivity model forms a productivity index (PI) for each subcost center by dividing the conventional productivity measure ($CPM_\$$) by the standard ($SPM_\$$), (Figure 3-1). The standard is, thus, a general normalizing criterion. All subcost centers can be compared on the basis of how well they produced in relation to their own standard. The productivity index is then used to calculate the production measure (PM) of the output of the subcost center (Figure 3-1). This is formed by multiplying the labor productivity index by the labor costs, and is a measure of the

value of the output.

By summing the PM's of the subcost centers, the model forms a measure of the total output value of the total productivity measure (TPM) of the cost center. When this is divided by the total labor costs (TLC), the result is an aggregate productivity index for the whole cost center, which is an average of the productivity indices of the subcost centers weighted by their labor costs. By summing the total production measures and labor costs to the station or major command level, similar productivity indices for the entire station or major command are formed (Figure 3-1).

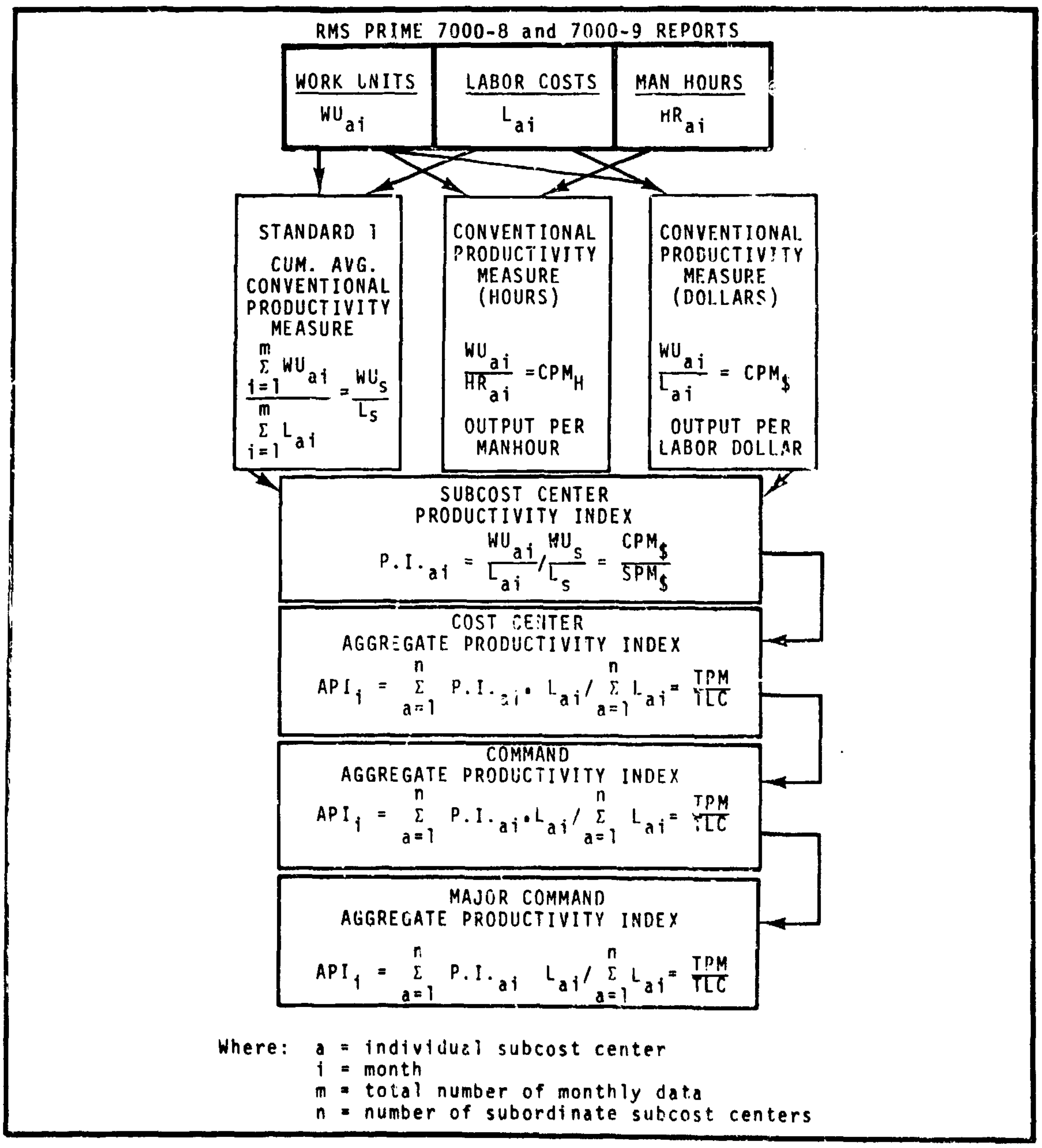

Figure 3-1 Data Sources and Flow in the Productivity Measurement Model

LIMITATIONS AND ASSUMPTIONS

> Productivity measurements cannot be arbitrarily applied. The nature of the data, or of the work done, may significantly change the meaning of the measurements.

Productivity in the most general sense is the relation of outputs to inputs, production to costs, or simply "what was done" to "what it took to do it". The validity of a productivity measure, then, depends on the accuracy of the measurement of outputs and inputs. Since the PMM assumes that RMS PRIME data accurately and meaningfully measures inputs and outputs, the user should be aware of the cases when this is not true. Figure 3-2 presents a summary of the cases which limit or change the applicability of productivity measures.

The first problem, inaccurate reporting of data, is a continuing problem in any information system. The PMM is a helpful tool in limiting these inaccuracies and can be used for data verification. Errors which might not otherwise be noticed often result in obviously questionable productivity measures. The accuracy of the data should always be checked before accepting any productivity measure which is either extremely high or low.

Although most subcost centers actually perform a variety of functions, the mix of outputs is usually constant enough, and the differences small enough, so that the work units are an acceptably accurate measure of the total output. In some cases, this is not true, and the productivity measures then have limited application. A prime example is the public affairs or public information office which counts a telephone call and a formal briefing equally. Where possible, significantly different outputs should be weighted.

In other cases, even though there is only a single item counted for the work unit, the result may be only a very crude approximation of the work done. An example of this is the ground electronics maintenance subcost center whose work unit is cubic feet of electronic gear maintained.

The PMM implicitly assumes that high productivity has a positive value. However, a higher productivity may not be desirable in some cases because of the nature of the function of the subcost center. Subcost centers where quality of output is critical but unquantifiable is a case in point. A course whose work unit is man months of instruction can only have a meaningful productivity measure if the quality of the instruction does not vary. This is not an unrealistic assumption, but it does limit the ability of productivity measures. The essence of an increase in productivity would not be an increase in man months of instruction per labor dollar, but an increase in the amount of learning per man month of instruction, and this cannot be measured.

Continuing high productivity in subcost centers which have the mission of being prepared to handle emergencies is not necessarily desirable. A medical facility with high productivity measures may be understaffed and unprepared for an epidemic or catastrophe. Likewise, a high productivity measure for an aircraft maintenance section may mean that there is a queue of aircraft awaiting repair. In this case, while the maintenance section is highly productive, the base efficiency is reduced because they lack the manpower required to return aircraft to service promptly. High productivity levels may not be desirable for subcost centers whose function and activity level is determined by policy. The personnel services such as the chaplain's office, family service center, and special services fall into this category. The quality of their work is as important, or more important, than the quantity, but since their output is measured in number of persons served, a high productivity may well mean less service to each, or simply that they are understaffed.

A. MEASUREMENT INACCURACIES

1. Inaccurate reporting of data
2. Work units which do not accurately reflect output
   a. Multiple types of output which are not weighted
   b. Single output which does not reflect work required

B. PROBLEMS RELATED TO NATURE OF FUNCTION

1. Quality is crucial but unquantifiable
2. Preparedness for contingencies is important
3. Functions are determined by policy

Figure 3-2. Problems Which Alter or Limit the Use of Productivity Measures

SECTION 4

MANPOWER ALLOCATION MODEL AND PRODUCTIVITY

MEASUREMENT MODEL APPLICATIONS

RELATIONSHIP OF MODELS TO PPBS

The Manpower Allocation and Productivity Measurement Models are designed to be directly useful in the Planning Programming and Budgeting System (PPBS) of the Department of Defense which requires an exchange of information and data related to manpower requirements and the justification of these requirements.

The PPBS requires extensive formal dialogue relative to Navy manpower and involves several activities within the DoD and Department of the Navy. At any one point in time, these activities may be concerned with manpower requirements for five different fiscal years. For example, work on the FY'72 budget began in February 1969 with the receipt of the update of the Department of Defense five-year defense program (FYDP). As the dialogue continues (Figure 4-1) more constraints are defined in terms of the force level requirements, budget limitations, policies related to the number and mixture of personnel available, and, finally, constraints related to detailing specific individuals to fill the defined manpower requirements. More constraints are defined as the time for implementing the particular budget approaches. In general, there are at least three levels in which they are applicable in the PPBS.

First, the allocation model can be used to generate unconstrained Navy manpower requirements as a function of total planned Navy forces. An example of this use would be as an input from the Office of the Chief of Naval Operations (OpNav) to the Joint Chiefs of Staff (JCS) for the Manpower Annex of the Joint Strategic Objectives Plan, Volume 1, Force Tabulations.

Second, the allocation model can be used to generate Navy manpower requirements/allocations as a function force size, such allocations to be generally constrained by total Navy personnel end strength or payroll dollars. Examples of this use would be in OpNav response to OSD Manpower Program Memoranda, JCS Joint Force Memoranda, Navy Program Objectives Memoranda, and to prepare Program Change Requests, Reclamas, and Five-Year Defense Program updates in the annual Planning, Programming and Budgeting cycle.

Third, the allocation model can be used to generate manpower allocations in implementation of program and budget decisions, and as specifically constrained by the inventory of personnel available to the Navy in the short run. The principal users of the models in this mode would be OpNav for manpower authorizations and BuPers for personnel distribution.

Each manpower allocation model developed has used the same basic structure of process analysis and linear programming to evaluate manpower requirements. These are predictive models used to determine the optimum (least cost) mix of labor

described in terms of service, series, grade, and NEC/NOBC) to produce a required shore activity output. In addition to this basic model formulation, a method for the competitive bidding for labor resources has been developed.[1] This scheme, in effect, "forces" managers to more efficiently use the types of labor which are abundant at a particular time. Finally, when a particular mixture of labor has been assigned to a shore activity, the effectiveness of this labor force can be measured by means of the appropriate productivity measurement model.

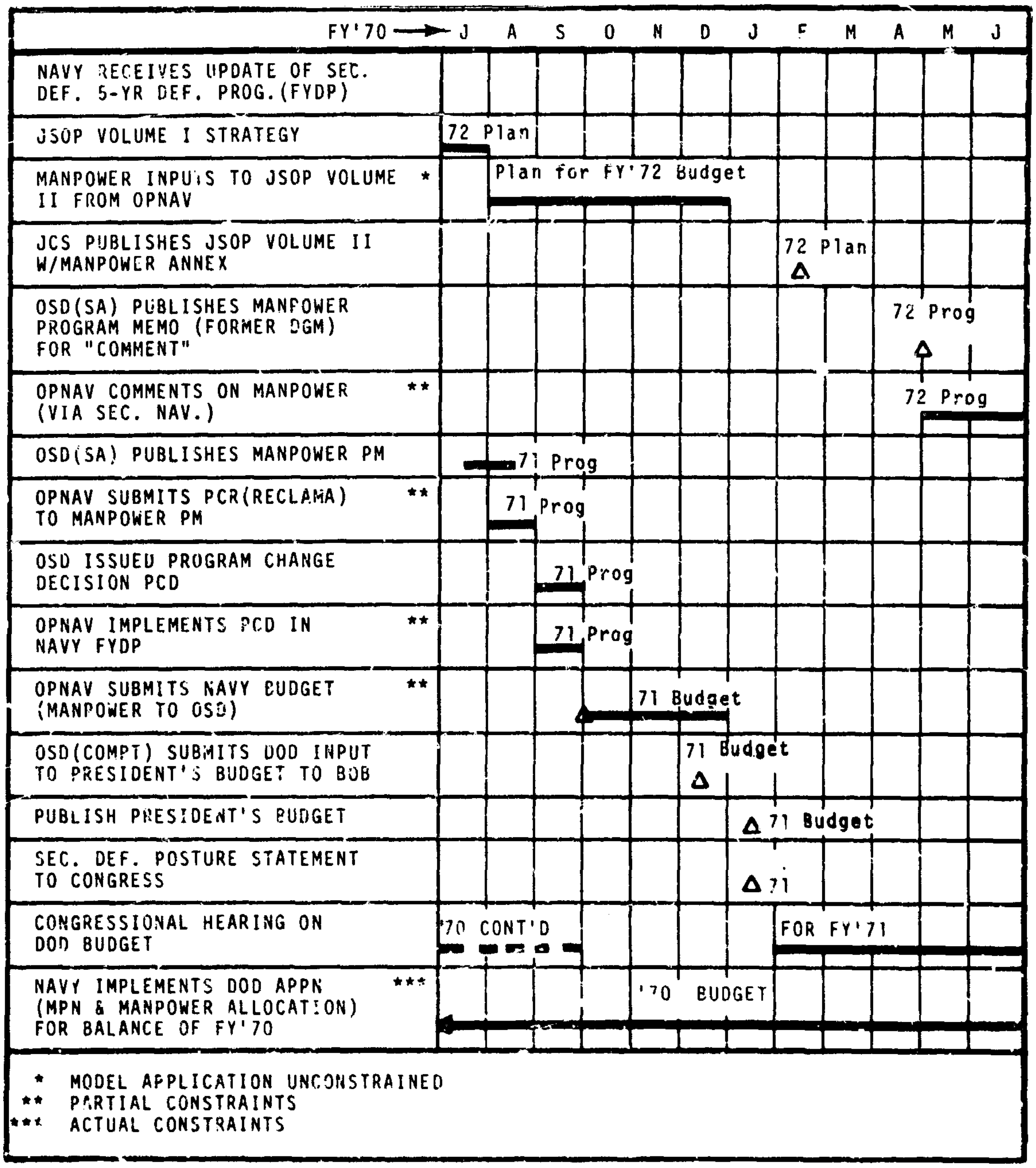

Figure 4-1. PPBS Activities Relating to Manpower in FY'70

1. Manpower Allocation Model, Final Report, Contract N00022-69-C-0076, May 1969

CONTINUOUS MODEL APPLICATIONS IN THE PPBS

> In the continuing process of responding to the PPBS dialogue, the models are not intended to be static tools.

A planned program of model applications is required in order to seek more nearly optimal solutions in response to the PPBS requirements over time. These models are of complex organizations or systems in which many intangibles, such as management capability, morale, environment, etc., bear directly on the performance and capability of the shore activity. Thus, it would be unrealistic to take a "snap shot" of a navy shore establishment and use this data to describe the operation at some later time.

If the models are applied periodically over time in synchronization with the PPBS cycles, the net effect would be two-fold. First, more realistic data can be provided in the PPBS dialogue. Second, the establishment would be "forced" to more nearly optimum use of manpower. The scheme by which this could be accomplished is illustrated in Figure 4-2. Initially, actual historical data is used to form the two technologies. This data is derived from RMS PRIME, OPNAV reports, and related sources. Each level of model application described above (unconstrained, partially constrained, and constrained) results in an optimal least-cost solution. This solution then becomes, in effect, a requirement, or plan, in the PPBS at the appropriate level. In practice for numerous reasons, the plan may not be completely achieved. This fact may be determined from actual data (RMS PRIME, etc.). In subsequent applications of the model, the previous optimum solution can be used to form one technology, and the actual performance data (RMS PRIME) can be used for the second technology. The resulting optimum solution would then reflect, in effect, what is derived and what can be achieved. This successive model application is not unlike the functioning of a missile guidance system. Based on previous data, the guidance system generates a solution (steering command) for impact on the target. Due to errors inherent in the system or a target maneuver, the current solution can be in error. As updated data (scan of the guidance radar, for example) is received, a new solution with new steering commands is provided. This interrelationship between prediction and measured data results in the optimum solution; namely, impact of missile on target.

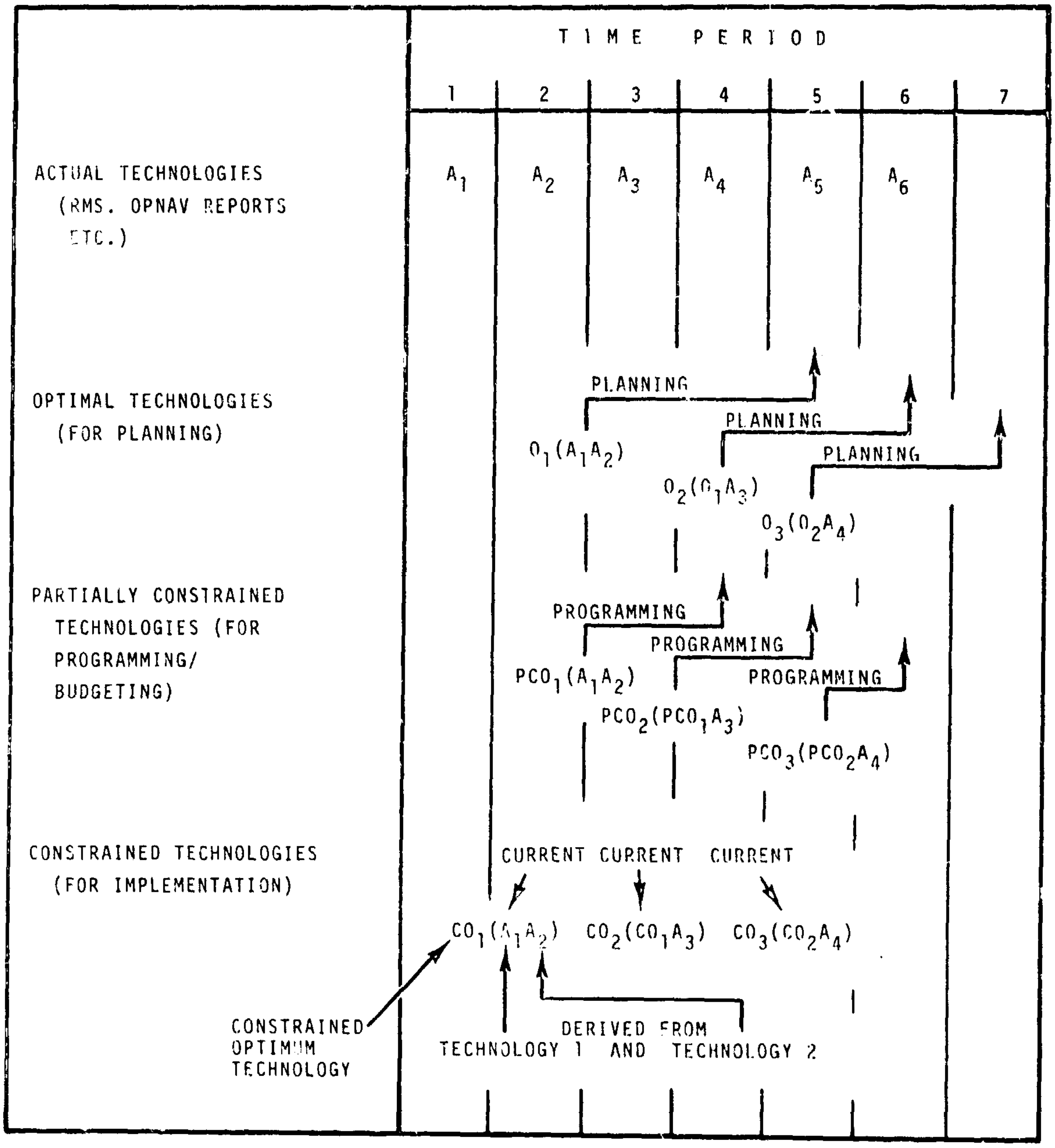

Figure 4-2. Continuous Model Usage in PPBS

RELATIONSHIP OF THE MANPOWER ALLOCATION MODEL AND PRODUCTIVITY MEASUREMENT MODEL

> The Manpower Allocation Model is used to determine optimum manpower allocation and is used in conjunction with the Productivity Measurement Model.

A productivity measurement provides a measure of the efficiency of allocating labor resources. A knowledge of the productivity levels and trends is essential for estimating optimum manpower needs and allocations accurately. The manpower allocation and productivity measurement models complement each other. The manpower allocation model is predictive and the productivity measurement model is basically analytical. The manpower allocation model tells what the outputs and labor inputs should be at an optimum level of operation. The productivity measurement model shows the actual ratio of outputs to labor costs and manhours. The ratio of outputs to inputs at optimality in the allocation model can be used as a standard in the productivity model. The use of this ratio as a standard has several advantages. First, the productivity model can be used to verify the predictions of the allocation model. Second, the standard is more realistic than the average of past productivities, since the allocation model considers shortages and excesses in various labor categories and the resulting need to trade off one type of labor for another.

An example of the possible interaction of the results of the productivity measurement model to the manpower allocation model can be demonstrated by considering data from a single cost center, 1J30, Training, at NAS Corpus Christi. For this example, the productivity measurements for the two time periods are shown in Figure 4-3. The standard used is the cumulative average over the entire four months period.

PRODUCTIVITY MEASURES
FOR COST CENTER R
TRAINING
AT
NAS CORPUS CHRISTI

TITLE / SUBCOST CENTER	RMS PRIME DATA: WORK UNITS	RMS PRIME DATA: MAN HOURS	RMS PRIME DATA: LABOR COSTS	CONVENTIONAL PRODUCTIVITY MEASURES: OUTPUT PER MANHOUR	CONVENTIONAL PRODUCTIVITY MEASURES: OUTPUT PER LABOR DOLLAR	STANDARD PRODUCTIVITY: PER DOLLAR	STANDARD PRODUCTIVITY: TYPE CODE	PRODUCTION MEASURE: VALUE OF OUTPUT	PRODUCTIVITY INDEX: PRODUCTIVITY COMPARED TO STANDARD
1J30 TRAINING (LOW PRODUCTIVITY)	1193	48199	1774	0.0237	0.6430	[illegible]	2	[illegible]	0.7947
1J30 TRAINING (HIGH PRODUCTIVITY)	1620	44286	1537	0.0366	0.[illegible]	[illegible]	2	[illegible]	1.2220

Figure 4-3. Sample Comparative (High/Low) Productivity Measurements

The effect which a difference in productivity can have on manpower allocation can be seen by comparing the manpower requirements when high productivity is used (Figure 4-4) and when the period of low productivity is used (Figure 4-5).

OPTIMUM COST CENTER MANPOWER ALLOCATIONS
COST CENTER: R TRAINING

SYSTEM ANNUAL FPOR: 1080
ACTIVITY: 00216 CORPUS CHRISTI

OPTIMUM WORK UNITS
6J30 405

MANPOWER REQUIREMENTS SUMMARY

MILITARY			CIVILIAN			
OFFICER	ENLISTED	TOTAL	GRADED	UNGRADED	TOTAL	GRAND-TOTAL
14	61	75	20	0	20	95

********BILLET IDENTIFICATION********		****LABOR SKILL CATEGORY****				****MONTHLY MAN-HOURS AND MANPOWER****				
SUBCOST CENTER	********POSITION TITLE******	NEC/ NOBC	SERVICE	SERIES	GRADE	HOURS REQUIRED	LEAVE AND NON-AVAILABLE	GROSS HOURS	MANPOWER CIV	MIL
6J30	TRAINING OFFICER	3290	0	1310	5	84	84	168	0	1
6J30	ACADEMIC INST OFFICER	3290	0	1310	4	84	84	168	0	1
6J30	DR CELEST NAV INSTR	3262	0	1320	3	1178	166	1344	0	8
6J30	DR CELEST NAV BR OFF	3236	0	1370	4	84	84	168	0	1
6J30	ASW INSTR	3236	0	1370	3	252	84	336	0	2
6J30	TRUG AIDS OFFICER	5785	0	6400	3	84	84	168	0	1
6J30	HUDRAULICS	9501	E	ADR	6	168	168	336	0	2
6J30	TRAINING SUPERVISOR	9501	E	AE	8	84	84	168	0	1
6J30	MATERIAL		E	AK	6	84	84	168	0	1
6J30	MNT INSTRUCTOR		E	AT	6	168	168	336	0	2
6J30	GRAPHICS		E	DM	3	84	84	168	0	1
6J30	GEN DUTY		E	FA	2	168	168	336	0	2
6J30	GEN DUTY		E	G	3	614	58	672	0	4
6J30	GEN DUTY		E	G	2	310	26	336	0	2
6J30	GEN DUTY		E	G	1	0	0	0	0	0
6J30	MAINT & TRNG		E	SK	6	84	84	168	0	1
6J30	MAINT		E	TD	8	155	13	168	0	1
6J30	INSTR		E	TD	6	1136	208	1344	0	8
6J30	MAINT		E	TD	5	2015	169	2184	0	13
6J30	MAINT & TRNG		E	TD	4	2170	182	2352	0	14
6J30	INSTR		E	TD	3	1085	91	1176	0	7
6J30	PROJECT TRANSITION		E	YN	8	84	84	168	0	1
6J30	GEN DUTY		E	YN	4	84	84	168	0	1
6J30	CLERK STENO		GS	312	4	84	84	168	1	0
6J30	SECRETARY STENOGRAPHER		GS	318	5	84	84	168	1	0
6J30	CLERK-TYPIST		GS	322	3	168	168	336	2	0
6J30	PROJ TRANS COUNSELOR		GS	1701	9	84	84	168	1	0
6J30	SUPER TRAING SPEC		GS	1712	13	129	39	168	1	0
6J30	TRNG SPEC INSTRU FLT		GS	1712	12	141	27	168	1	0
6J30	SUPERVISOR TRNG INST		GS	1712	11	141	27	168	1	0
6J30	TRNG INSTR INSTRU FLT		GS	1712	9	1692	324	2016	12	0

Figure 4-4. Sample High Productivity Measurements

OPTIMUM COST CENTER MANPOWER ALLOCATIONS

COST CENTER: R TRAINING

SYSTEM ANNUAL FPOR: 1080
ACTIVITY: 00216 CORPUS CHRISTI

OPTIMUM WORK UNITS
6J30 405

MANPOWER REQUIREMENTS SUMMARY

MILITARY			CIVILIAN			
OFFICER	ENLISTED	TOTAL	GRADED	UNGRADED	TOTAL	GRAND-TOTAL
19	84	103	27	0	27	130

********BILLET IDENTIFICATION*********		****LABOR SKILL CATEGORY****				*****MONTHLY MAN-HOURS AND MANPOWER****				
SUBCOST CENTER	*********POSITION TITLE******	NEC/ NOBC	SERVICE	SERIES	GRADE	HOURS REQUIRED	LEAVE AND NON-AVAILABLE	GROSS HOURS	MANPOWER CIV	MIL
6J30	TRAINING OFFICER	3290	0	1310	168	129	39	168	0	1
6J30	ACADEMIC INST OFFICER	3290	0	1310	4	129	39	168	0	1
6J30	DR CELEST NAV INSTR	3262	0	1320	3	1820	196	2016	0	12
6J30	DR CELEST NAV BR OFF	3236	0	1370	4	129	39	168	0	1
6J30	ASW INSTR	3236	0	1370	3	388	116	504	0	3
6J30	TRUG AIDS OFFICER	5785	0	6400	3	129	39	168	0	1
6J30	HUDRAULICS	9501	E	ADR	6	259	77	336	0	2
6J30	TRAINING SUPERVISOR	9501	E	AE	8	129	39	168	0	1
6J30	MATERIAL		E	AK	6	129	39	168	0	1
6J30	MNT INSTRUCTOR		E	AT	6	259	77	336	0	2
6J30	GRAPHICS		E	DM	3	129	39	168	C	1
6J30	GEN DUTY		E	FA	2	259	77	336	0	2
6J30	GEN DUTY		E	G	3	943	165	1008	0	5
6J30	GEN DUTY		E	G	2	478	26	504	0	3
6J30	GEN DUTY		E	G	1	0	0	0	0	0
6J30	MAINT & TRNG		E	SK	6	129	39	168	0	1
6J30	MAINT		E	TD	8	248	28	336	0	2
6J30	INSTR		E	TD	6	1750	98	1848	0	11
6J30	MAINT		E	TD	5	3120	72	3192	0	19
6J30	MAINT & TRNG		E	TD	4	3340	188	3528	0	21
6J30	INSTR		E	TD	3	1664	184	1848	0	11
6J30	PROJECT TRANSITION		E	YN	8	129	39	168	0	1
6J30	GEN DUTY		E	YN	4	129	39	168	0	1
6J30	CLERK STENO		GS	312	4	129	39	168	1	0
6J30	SECRETARY STENOGRAPHER		GS	318	5	129	39	168	1	0
6J30	CLERK-TYPIST		GS	322	3	259	77	336	2	0
6J30	PROJ TRANS COUNSELOR		GS	1701	9	129	39	168	1	0
6J30	SUPER TRAING SPEC		GS	1712	13	198	138	336	2	0
6J30	TRNG SPEC INSTRU FLT		GS	1712	12	217	119	336	2	0
6J30	SUPERVISOR TRNG INST		GS	1712	11	217	119	336	2	0
6J30	TRNG INSTR INSTRU FLT		GS	1712	9	2610	78	2688	16	0

Figure 4-5. Sample Low Productivity Measurements

SECTION 5

MODEL INPUTS

LABOR INPUT BY SKILL CATEGORY AND LEVEL

> A complete listing of the raw labor inputs forms a basis for the generation of manpower assignments for each specified level of final product output rate. Final products data available for model input is also listed for comparison with desired CNAVANTRA output rates.

The following is a complete listing of labor inputs for each of the three naval air stations of CNAVANTRA NAS Corpus Christi, NAS Chase, and NAS Kingsville. Each page will contain a specific cost center with the skill levels allocated (officer, warrant officer, enlisted and wage borad). Notice that each rank or rating may contain many different categories or designations. The MAM accetps each laobr category as a unique input.

Figure 5-1 shows the available data for the Advanced Jet System at NAS Kingsville and Chase.

Figure 5-2 shows available data for Advanced Prop System at NAS Corpus Christi.

A COMMAND AND STAFF

CORPUS CHRISTI

LABOR TYPE AND GRADE						
CAPT	1310,					
CDR	4100,					
LCDR	2500,	1310,	4100,			
LT	3500,	4105,	1324,			
LTJG	1355,	1105,				
E- 8	BMCS,	SDCS,				
E- 7	SMC,	BMC,	QMC,	ENC,	MMC,	YNC,
E- 6	YN1,					
E- 3	AN,	SN,	YNSN,	JOSN,		
E- 2	SA,					
GS-12	343,					
GS- 7	318,					
GS- 6	315,	312,				
GS- 5	319,					
GS- 4	312,					
GS- 3	322,					
GS- 2	322,					

B COMPTROLLER

CORPUS CHRISTI

LABOR TYPE AND GRADE								
CDR	3700,							
LTJG	3105,							
E- 7	DKC,							
E- 6	DK1,							
E- 5	DK2,							
E- 4	DK3,							
E- 3	SN,	AN,						
E- 2	SA,							
GS-13	505,							
GS-12	510,							
GS-11	510,	525,	560,					
GS- 9	525,	560,	501,					
GS- 7	525,	520,	545,					
GS- 6	525,	544,	520,	501,	540,			
GS- 5	501,	318,	510,	525,	520,	544,	545,	540,
GS- 4	305,	520,	312,	525,	501,	544,	545,	540,
GS- 3	322,	520,	354,	544,				

C INDUSTRIAL RELATIONS

CORPUS CHRISTI

LABOR TYPE AND GRADE			
GS-13	201,		
GS-12	803,	221,	201,
GS-11	212,	201,	235,
GS- 9	018,	201,	
GS- 7	221,	212,	203,
GS- 6	203,		
GS- 5	1820,	318,	221,
GS- 4	301,	203,	312,
GS- 3	322,		

F DATA PROCESSING

CORPUS CHRISTI

LABOR TYPE AND GRADE						
LT	3100,					
E- 7	DPC,					
E- 6	DP1,					
GS-13	330,					
GS-12	334,					
GS-11	334,					
GS-10	341,					
GS- 9	334,	322,	334,			
GS- 8	332,					
GS- 7	344,	334,				
GS- 6	392,	335,	356,	327,		
GS- 5	332,	335,	322,			
GS- 4	318,	301,	392,	335,	356,	332,
GS- 3	332,	356,	350,			
GS- 2	322,	356,				
WB- 8	4500,					

D ADMINISTRATION

CORPUS CHRISTI

LABOR TYPE AND GRADE											
CDR	1317,										
LCDR	6202,	1350,									
LT	1100,										
LTJG	1105,	1355,									
ENS	1105,										
WO- 4	7821,										
WO- 1	7132,										
E- 9	BMCM,	SPCM,									
E- 8	QMCS,	PNCS,	ADCS,								
E- 7	MMC,	BMC,	SFC,	SEC,	EMC,	ENC,	ADRC,	AMSC,			
E- 6	BM1,	MM1,	SFC1,	DM1,	SD1,	CS1,	SM1,	ET1,	PN1,	DN1,	MR1,
	EM1,	EN1,	QM1,	AE1,	YN1,						
E- 5	BM2,	QM2,	EN2,	DM2,	SD2,	YN2,	EM2,	SH2,	ML2,	PN2,	MM2,
	TD2,	SM2,	ATN2,								
E- 4	MM3,	EN3,	EN3,	CYN3,	BM3,	YN3,	SD3,	MU3,	PN3,	QM3,	DP3,
E- 3	SN,	FN,	SN,	CYNSN,	PNSA,	TN,	PNSA,	SMSN,	QMSN,	ADJAN,	AEAN,
	AMSAN,	YNSN,									
E- 2	FA,	SA,	CYNSA,	TA,	AA,						
GS-11	1101,										
GS-10	1410,										
GS- 9	1101,										
GS- 5	204,	501,									
GS- 4	204,										
GS- 3	322,	204,									
WB- 1	35064,										

G SUPPLY

CORPUS CHRISTI

LABOR TYPE AND GRADE	
LCDR	3100,
LT	3702, 3100,
WO- 3	7991,
E- 8	CSCS,
E- 7	CSC,
E- 6	BT1, BM1, SK1, CS1,
E- 5	BM2, CS2, AK2,
E- 4	CS3,
E- 3	SKSN, SN,
E- 2	SA,
GS-12	2003,
GS-11	2001, 1102,
GS-10	2030, 2130, 2001,
GS- 9	1102, 2050,
GS- 8	2102, 2001,
GS- 7	2134, 2135, 1670, 1102, 2001,
GS- 6	2020, 1102, 2005, 2040,
GS- 5	2135, 2134, 2005, 1670, 2020, 2040, 2050,
GS- 4	2005, 2135, 2134, 2040, 2020, 312, 540,
GS- 3	2040, 322, 2005, 312, 2020,
GS- 2	2005, 322,
WG-10	69054,
WG- 8	46021,
WG- 6	57054, 69007, 70002, 74002,
WG- 5	54013, 57004, 69007, 74004,
WG- 4	74004,
WG- 2	38002,
WS-56	69054,
WS-54	46021,
WS-52	69007,
WS-40	69054,
WS-36	57062, 69007,
WX-47	46022,
WX-43	69068,

J AIRCRAFT MAINTENANCE

CORPUS CHRISTI

LABOR TYPE AND GRADE	
LCDR	1315, 1350, 1317,
LT	6851, 1325, 6852, 5802, 6602,
LTJG	1325,
E- 9	AVCM, AFCM,
E- 8	AZCS, PRCS, AMCS, AECS, AMSC, ADCS, ACCS,
E- 7	AZC, AMSC, AKC, ADRC, ASC, ATC, AEC, AMHC, ADJC,
E- 6	PR1, PR1, AMS1, AMS1, AMH1, MR1, AK1, ADR1, ADJ1, AT1, AMF1, AS1, AE1,
E- 5	YN2, PR2, AMH2, AMS2, AK2, ADR2, AE2, ADJ2, ASE2, ASM2, ATN2, AME2, AH2, SH2,
E- 4	AZ3, PR3, AMS3, AMH3, ADR3, AE3, ASM3, ASE3, ATN3, ATR3, ADJ3,
E- 3	AN, AMSAN, AMHAN, ADRAN, AEAN, ASHAN, ATNAN, ADJAN, AKAN, AZAN, SN,
E- 2	PRAA, MREA, AA, ASHAA, AEAA, FA, SA,
GS- 9	1710, 856,
GS- 7	2005, 1670,
GS- 5	2005, 318, 305, 1712,
GS- 4	2005, 2040,
GS- 3	2005, 520, 2040, 305, 322,
WG-11	8602,
WG- 8	88038, 86002,

4CD MEDICAL SERVICES

CORPUS CHRISTI

LABOR TYPE AND GRADE				
CAPT	2200,	2100,		
CDR	2300,			
LCDR	2100,			
LT	2205,	2200,	2105,	2300,
E- 8	HMCS,			
E- 7	HMC,			
E- 6	DT1,	HM1,	TD1,	
E- 5	DT2,	HM2,	TD2,	
E- 4	DT3,	HM3,	HA3,	
E- 3	DN,	HN,	SN,	
E- 2	AA,	SA,		
E- 1	AR,			
GS-12	602,			
GS- 9	0610,			
GS- 5	301,	2020,	322,	663,
GS- 4	322,			
GS- 3	681,	682,	322,	
GS- 2	322,			

P OPERATIONS

CORPUS CHRISTI

LABOR TYPE AND GRADE									
CDR	1310,								
LCDR	1315,	1310,	6602,						
LT	1320,	6702,	6612,	6602,					
LTJG	1355,								
WO- 4	7611,								
E- 8	ADCS,	ETCS,	ACCS,	ACCS,					
E- 7	ETC,	GMGC,	ACC,						
E- 6	YN1,	ET1,	EN1,	AO1,	PH1,	AC1,			
E- 5	BM2,	EM2,	YN2,	ETN2,	ETR2,	AK2,	GMG2,	PH2,	AC2,
E- 4	SFP3,	ETR3,	ETN3,	AE3,	EM3,	AO3,	GMG3,	PH3,	AC3,
E- 3	AN,	SN,	ETNSN,	ETRSN,	ACAN,	PHAN,	ACAN,		
E- 2	AA,	ADRAA,	ENFA,	SA,	ACAA,				
GS- 7	560,	1060,	2152,						
GS- 5	318,	1050,							
GS- 4	312,								
GS- 3	312,								
WB-12	26014,								
WB-10	33008,								
WB- 8	86002,								
WB- 6	57014,								
WS-58	26014,								
WS-42	26014,								

R TRAINING

CORPUS CHRISTI

LABOR TYPE AND GRADE					
CDR	1310,				
LCDR	1320,	1315,			
LT	1320,	1320,	1327,	1325,	6401,
E- 7	TDC,	ATC,	YNC,		
E- 6	AK1,	AD21,	AT1,	TD1,	SK1,
E- 5	TD2,				
E- 4	TD3,	YN3,			
E- 3	TDAN,	SN,	DMSA,	AN,	
E- 2	AA,	SA,	FA,		
E- 1	AR,				
GS-13	1712,				
GS-12	1712,				
GS-11	1712,				
GS- 9	1712,	1701,			
GS- 5	318,				
GS- 4	312,				
GS- 3	322,				

SR TRARON 27

CORPUS CHRISTI

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LABOR TYPE
AND GRADE
  CAPT       3100,
  CDR        1310,
  LCDR       1310, 6300, 1315, 1317,
  LT         2105, 1327, 1310, 1317, 1315,
  LTJG       1315, 1310, 1355, 1105,
  ENS        1105, 1355,
  WO- 1      7412, 7402,
   E- 9      AFCM,
   E- 8      ADCS,
   E- 7      YNC , PNC , AFCC, ATC , AEC , AMSC, AMHC, AKC , AZC ,
   E- 6      BM1 , YN1 , PN1 , MM1 , SF1 , ADR1, AT1 , AO1 , AE1 , AMS1, AMH1,
             PR1 , AK1 , AZ1 ,
   E- 5      YN2 , PN2 , SFP2, ADR2, ATN2, AC2 , AE2 , AMS2, AMH2, AME2, PR2 ,
             AK2 , AZ2 ,
   E- 4      YN3 , PN3 , PC3 , ADR3, ATN3, ATR3, AO3 , APH3, PH3 , AE3 , AMS3,
             AMH3, PR3 , AK3 , AZ3 , ASE3,
   E- 3      AMSAN,AMHAN,ARHAN,ATRAN,ATNAN,ADRAN,ADJAN, YNSN, PNSN, SN , AN ,
             AEAN, PRAN, AKAN, AZAN,
   E- 2      AMSAA,AMHAA,ADRAA, YNSA, PNSA, SA , AA , AEAA, AZAA, CA ,
```

SS TRARON 28

CORPUS CHRISTI

```
LABOR TYPE
AND GRADE
  CDR        1310, 1350,
  LCDR       1310, 1315, 1010,
  LT         2100, 6802, 1310, 1315,
  LTJG       1105, 1355, 1315, 1310,
  ENS        1355,
   E- 7      YNC , PNC ,
   E- 6      PN1 , MM1 , ADR1, AT1 , AE1 ,
   E- 5      YN2 , PN2 , ADR2, ATN2, AE2 , AMS2, AMH2,
   E- 4      YN3 , PN3 , PC3 , ADR3, AE3 , AMS3, AMH3, PH3 ,
   E- 3      NYSN, YNSN, PNSN, SN , AN ,
   E- 2      SA , AN ,
```

ST TRARON 29

CORPUS CHRISTI

```
LABOR TYPE
AND GRADE
  CDR        1310,
  LCDR       1315, 1312, 1317, 1310, 1313,
  LT         2105, 1320, 6802, 1315, 1327, 1325, 1310, 1312,
  LTJG       6332, 1325, 1320, 1315, 1105, 1355,
  ENS        1355,
   E- 9      AFCM,
   E- 8      ADCS, AMCS,
   E- 7      YNC , ADRC, ATC , AEC , AMSC, AKC ,
   E- 6      BM1 , QM1 , YN1 , PN1 , MM1 , ADR1, AT1 , APH1, AE1 , AMS1, AMH1,
             AME1, AK1 , AZ1 ,
   E- 5      BM2 , YN2 , PN2 , ADR2, ATR2, ATN2, APH2, AE2 , AMS2, AMH2, AME2,
             PH2 , AK2 ,
   E- 4      YN3 , PN3 , ADR3, ATR3, APH3, AE3 , AMS3, AMH3, AZ3 ,
   E- 3      AMSAN,AMHAN,ATRAN,ADRAN, YNSA, SN , AEAN, PRAN, AZAN, AN ,
   E- 2      ADRAA, SA , AA ,
```

SW TRARON 31

CORPUS CHRISTI

LABOR TYPE AND GRADE	
CDR	1310,
LCDR	1310, 1370, 1360, 1315, 1331,
LT	2105, 1370, 6802, 6852, 1315, 1310,
LTJG	1105, 1355, 1315, 1310, 1395,
ENS	1105, 1355,
WO- 4	7410,
E- 9	AFCM,
E- 8	ADCS,
E- 7	YNC , PNC , ADRC, ATC , AEC , AMSC, AMHC,
E- 6	RM1 , YN1 , PN1 , SF1 , ADR1, AT1 , AO1 , AE1 , AMS1, AMH1, PR1 ,
E- 5	YN2 , PN2 , MM2 , ADR2, ATR2, ATN2, AO2 , AE2 , AMS2, AMH2, AME2, PR2 , AK2 , AZ2 ,
E- 4	RM3 , YN3 , PN3 , ADR3, ATN3, AO3 , AE3 , AMS3, AMH3, PR3 , AK3 , AZ3 ,
E- 3	AN ,AMSAN,AMHAN,ATRAN,ADRAN, YNSN, SN , FN , AEAN, PRAN, AKAN, AZAN,
E- 2	AA ,ADRAA, SA , AZAA,

6B SECURITY

CORPUS CHRISTI

LABOR TYPE AND GRADE											
CDR	1310,										
LT	1105,										
WO- 4	7541,										
E- 9	BMCM,	AFCM,									
E- 8	ABHCS,	BTSC,	AMCS,								
E- 7	PNC,	MMC,	SKC,	SFC,	ABHC,	BTC,					
E- 6	PN1,	MM1,	BT1,	EN1,	BM1,	SF1,	GMG1,	ABH1,	EM1,	GM1,	QM1,
	SM1,	ML1,									
E- 5	SFP2,	IC2,	BT2,	MR2,	MM2,	PN2,	YN2,	SK2,	SHB2,	SFM2,	ABH2,
	QM2,	BM2,	SK2,	GMG2,	SH2,						
E- 4	PN3,										
E- 3	SN,	PCSN,	CYNSN,	AN,							
E- 2	AA,	SA,	ABHAA,								
GS-11	81,										
GS- 9	90,	[illegible]									
GS- 8	81,										
GS- 7	560,	81,									
GS- 6	81,	[illegible]	82,								
GS- 5	31,										
GS- 4	322,	81,	85,								
GS- 3	322,	81,	85,								
GS- 2	322,										

S PUBLIC WORKS

CORPUS CHRISTI

```
LABOR TYPE
AND GRADE
   CAPT       5105,  5405,
   LCDR       5103,
   LTJG       5100,  5105,
    E- 8      BUCS,
    E- 7      CMC,
    E- 6      BU1,   UT1,   CM1,   EO1,
    E- 5      CM2,
    E- 4      EO3,
    E- 3      EOCA,   SA,
   GS-12       341,   801,
   GS-11       341,   810,   801,   830,   809,
   GS-10      1173,
   GS- 9       560,   343,   808,
   GS- 8      2001,  1173,
   GS- 7       525,   819,   817,
   GS- 6       342,
   GS- 5       313,   501,   382,   301,  2020,
   GS- 4       203,   382,   301,   305,   312,  2020,   322,
   GS- 3       322,   382,   301,
   GS- 2       303,
   WB-11      35009,54007,46005,41004,53006,28004,28002,28005,57022,37004,42003,
              42004,42006,38006,53015,42002,37003,58003,34010,57010,
   WB-10      54007,46007,41002,31006,34017,34007,58023,36050,41043,
   WB- 9      48004,54025,57014,57056,54015,54008,
   WB- 8      54005,57001,
   WB- 7      54023,57005,57055,
   WB- 6      46007,57056,
   WB- 5      46007,41002,46007,28005,36001,35052,57022,42004,38004,42003,53006,

   WB- 4      52001,57005,
   WB- 3      35003,
   WD-46      57050,
   WS-05      47040,
   WS-86      47251,
   WS-73      28005,47056,47040,53051,54051,
   WS-72      47040,
   WS-71      57051,
   WS-57      54051,46005,28004,53006,28005,57022,47030,42004,58051,
   WS-56      41002,46007,47056,58022,
   WS-55      54025,57051,54051,
   WS-51      35062,
   WS-41      37003,
   WS-39      54015,
   WS-36      46007,
   WX-40      58014,58044,
   WD-38      47047,
   WD-38      28004,
   WD-38      47059,
   WD-37      47007,
   WD-35      47082,
```

21 SUPPLY ADMINISTRATION

CORPUS CHRISTI

```
LABOR TYPE
AND GRADE
   CAPT        3100,
   LT          3103,
    E- 9       SKCM,
   GS-13       2003,
   GS-11        345,  2003,
   GS- 9        341,  2003,  2001,
   GS- 8        560,
   GS- 7        344,  2003,
   GS- 5        318,   501,   305,
   GS- 4        312,   203,   305,
   GS- 3        322,   530,   305,   301,
   GS- 2        322,   305,
```

STAF CNAVANTRA STAFF

CORPUS CHRISTI

LABOR TYPE AND GRADE	
ADM	131C,
CAPT	131C, 250C,
CDR	1310, 1313,
LCDR	1317, 1312, 11CC, LSMC, 1310, 1350, 6802, 5100, 3100, 1325,
LT	132C, 250F, 5202, 4402, 3702, 6802,
LTJG	1388, 11C5,
E- 9	AFCM,
E- 8	PNCS, YNCS, AMCS, AZCS,
E- 7	MUC, YNC, JOC, GMC, ADJC, SMC, AKC, ATC,
E- 6	SD1, MU1, PN1, ADR1, GMG1, MM1, AK1, SK1, YN1, AZ1, AT1,
E- 5	BM2, MU2, PN2, MM2, YN2,
E- 4	MU3, YN3,
E- 3	TN, MLSN, SN,
E- 2	FACA,
GS-13	345, 2150, 801, 504,
GS-12	215C, 801, 560,
GS-11	343, 301, 510, 560,
GS- 9	1531, 360,
GS- 8	318,
GS- 7	318, 344, 215C,
GS- 6	312, 305, 1531,
GS- 5	318, 305, 301, 1530, 1531,
GS- 4	344, 305, 322, 312, 204, 301, 1021,
GS- 3	322, 312,
GS- 2	301, 322,
WB- 2	35002,
W- 4	7851,

A COMMAND AND STAFF

CHASE

LABOR TYPE AND GRADE			
CAPT	131C,		
CDR	131C,		
LCDR	41CC,		
LT	1625,	131C,	
E- 7	SEC,	MMC,	
E- 6	RM1,		
E- 5	YN2,	QM2,	
E- 3	SA,		
GS- 9	C18,		
GS- 6	318,	315,	
GS- 3	322,		
GS- 2	322,		

B COMPTROLLER

CHASE

LABOR TYPE AND GRADE				
LCDR	31CC,			
GS-11	5C4,			
GS- 9	341,	56C,		
GS- 7	56C,	5C1,		
GS- 4	312,	5C1,	52C,	590,
GS- 3	322,			

C INDUSTRIAL RELATIONS

CHASE

LABOR TYPE AND GRADE		
GS-11	201,	
GS- 9	212,	235,
GS- 7	203,	
GS- 4	203,	
GS- 2	322,	

F DATA PROCESSING

CHASE

LABOR TYPE AND GRADE		
GS- 5	356,	
GS- 3	3C1,	351,
GS- 2	356,	

D ADMINISTRATION

CHASE

LABOR TYPE AND GRADE								
CDR	131C,							
LT	1727,	11CC,						
LTJG	11C5,							
WO- 4	1325,	1105,						
WO- 2	7823,							
WO- 1	76C3,							
E- 7	YNC,	ADRC,						
E- 6	SM1,	RN1,	RM1,	EN1,				
E- 5	RD2,	YN2,	EA2,	EM2,	RM2,	MM2,	ETN2,	IC2,
E- 4	RN3,	YN3,	CYN3,	RM3,				
E- 3	SN,	RMSN,	FE,					
E- 2	SA,	CYNSA,	FA,	AA,				
GS- 9	341,							
GS- 7	342,							
GS- 4	312,	322,	204,	[illegible]				
GS- 3	322,	305,	204,					
GS- 2	322,	302,						

G SUPPLY

CHASE

```
LABOR TYPE
AND GRADE
  LTJG      1105, 3105,
  WO- 4     7981,
   E- 9     CSCM,
   E- 8     SPCS, SKCS, MMCS,
   E- 7      SKC,  AKC,  CSC,
   E- 6      SD1,  AK1,  SK1,  MM1,  CS1,  PM1,
   E- 5      SD2,  AK2, APE2,  MM2,  CS2,  SK2,
   E- 4      SD3,  SK3,  AK3, APE3,  CS3,  CM3,
   E- 3       SN, AKAN, CSSA,   SN,
   E- 2       TA,   SA,   AA,   FA,
  GS- 9     2001,
  GS- 7     1470,
  GS- 6     2134,
  GS- 5      525, 2050, 2040, 2020, 2135,
  GS- 4     2040, 2020,
  GS- 3     2040,  322,  570,
  GS- 2      305,  322,
  WB-10    45055,
  WB- 8    46021,
  WB- 6    45007,
  WB- 5    74004,65007,54013,
  WB- 1    76006,
  WS-56    45054,
  WS-36    45007,
  WX-68    69045,
  WF- 2    74009,
```

J AIRCRAFT MAINTENANCE

CHASE

```
LABOR TYPE
AND GRADE
  CDR       1310,
  LCDR      1315, 1310,
  LT        6852, 1320, 6602, 1310,
  LTJG      1325,
  WO- 1     7612, 7602,
   E- 8     ADCS, AMCS, ATCS,
   E- 7      AKC, ADJC, AMSC, AMSC,  PRC,  AEC,  ATC,  PRC,  ASC,  AZC,
   E- 6      PR1, ADJ1, AME1,  AK1, AMH1, AMS1,  AT1,  AE1,  MM1,
   E- 5      AK2, ADJ2, AMS2, AMH2, ATR2, ATN2,  AE2, AME2, ASE2, ASH2, ASH2,

   E- 4      AZ3, ADJ3, AMS3, AMH3, ATN3,  PR3, AME3, ADR3, ASM3, ASH3,
   E- 3       AN, AKAN, MREA,AMSAN,ASMAN,ASHAN,
   E- 2       AA,ADJAA,AMHAA,
  GS- 7     1670,
  GS- 4      312,
  GS- 2      322,
  WB-12    26041,
  WB-11    28005,
  WB-10    82075,55078,
```

P OPERATIONS

CHASE

```
LABOR TYPE
AND GRADE
  CDR       1310,
  LCDR      1312, 1312,
  LT        1325, 6702,
  WO- 2     7452,
  WO- 1     7612,
   E- 8     ABCS, ACCS,
   E- 7      ACC,  AOC,  ETC,  EMC,
   E- 6      AC1,  PR1, ADJ1, AMH1, AME1,  MM1,  ET1,  EN1,  PH1,
   E- 5      BM2,  AK2,  AC2, ADR2, ADJ2, ABH2,  AO2,  CS2, ETR2, ETN2,  PH2,

   E- 4      AC3, ADJ3, AMS3, ATN3,  AE3, ABH3,  AC3, ETR3, ETN3,
   E- 3       AN, ACAN,ATNAN, AEAN, ICFN,ADJAN,AMSAN,   SN, ADAN,
   E- 2       AA,   SA,ADJAA,
  GS-11     2152,
  GS- 4      312,
  WS-42    26014,
  WG-12    26014,
```

4CD **MEDICAL SERVICES**

CHASE

LABOR TYPE
AND GRADE
CAPT 2200, 2100,
LT 2205, 2105,
E- 8 HMCS,
E- 7 HMC,
E- 6 DT1, HM1,
E- 5 HM2,
E- 4 DT3, HM3,
E- 3 DN, SN, FA, HN,
E- 2 SA,
GS- 5 301, 610,
GS- 3 322,

R **TRAINING**

CHASE

LABOR TYPE
AND GRADE
CDR 1310,
LT 1320, 1355, 1325,
E- 7 TDC,
E- 6 TD1, AF1,
E- 5 TD2,
E- 4 TD3,
E- 3 TDAN,
GS- 4 1702,
GS- 3 318,
GS- 2 322,

SP **TRARON 26**

CHASE

LABOR TYPE
AND GRADE
CDR 1310,
LCDR 1310, 1317,
LT 2105, 1310, 1315,
LTJG 1310, 1315, 6952, 1355, 1105,
ENS 1105, 1355,
E- 9 AFCM, AECM,
E- 8 YNCS, ADCS, AECS,
E- 7 MMC , ADJC, ATC , ACC , AEC , AMSC, AMHC, AZC , AMEC,
E- 6 MM1 , AKJ1, ADJ1, AT1 , AC1 , AO1 , AF1 , AMS1, AMH1, AME1, PR1 ,
AK1 , AZ1 , AS1 , RP1 , YN1 , PN1 ,
E- 5 MM2 , ADJ2, AKJ2, ATN2, AO2 , AE2 , AMS2, AMH2, AMF2, AME2, PR2 ,
AK2 , AZ2 , RM2 , YN2 , PN2 ,
E- 4 ADJ3, ATR3, ATN3, AC3 , AOD3, AE3 , AME3, AMS3, AMH3, PR3 , AK3 ,
AZ3 , ASE3, ASHC, YN3 , PN3 , PC3 ,
E- 3 SN , AEAN, ADJAN, PRAN, AXAN, AN , AMSAN, AMHAN, AMEAN, AGFAN, AQRAN,
ATRAN, YNSN, PNSN, JCSN,
E- 2 FA , ACAA, AA , AMSAA, AMHAA, ADJAA, PNSA, SA ,
E- 1 AR ,

SN **TRARON 24**

CHASE

LABOR TYPE
AND GRADE
CDR 1310,
LCDR 1310, 2100, 1315,
LT 1310, 1315, 6852,
LTJG 1105, 1325, 1315, 1310, 1390, 1395, 1355,
ENS 1105, 1355,
WO- 2 7412,
E- 8 ADCS,
E- 7 YNC , ADJC, ATC , ACC , AEC , AMSC, AMHC, AMEC, PRC , AKC , AZC ,
E- 6 YN1 , PN1 , PC1 , MM1 , ADJ1, AT1 , AC1 , AQ1 , AE1 , AMS1, AMH1,
AMH1, AME1, AK1 , AZ1 , AS1 ,
E- 5 RM2 , YN2 , PN2 , MM2 , ADJ2, ATN2, AC2 , AQF2, AE2 , AMS2, AMH2,
AME2, PR2 , AK2 , AZ2 ,
E- 4 YN3 , PN3 , ADJ3, ATN3, AC3 , AQF3, AE3 , AMS3, AMH3, AME3, PR3 ,
AK3 , AZ3 , ASM3, PH3 ,
E- 3 YNSN, PNSN, SN , ADJAN, AQAN, AQRAN, AESN, AMSAN, AMHAN, AMEAN, PRAN,
AKAN, AZAN, AN ,
E- 2 SA , ADJAN, ADJAA, AA ,
E- 1 AR , AA ,

SO TRARON 25

CHASE

LABOR TYPE AND GRADE	
CDR	1310,
LCDR	1310, 1315,
LT	2105, 1327, 1310, 1315,
LTJG	1105, 1355, 1350, 1310, 1315, 6852, 1355,
ENS	1105, 1355,
WO- 1	7412,
E- 9	AFCM,
E- 7	YNC , AKC , AZC , AMHC, AMEC, PRC , ATC , AOC , AEC , AMSC, ADJC,
E- 6	AK1 , AZ1 , AMS1, AMH1, AME1, PR1 , AT1 , AO1 , AE1 , MM1 , ADJ1, RM1 , YN1 , PN1 ,
E- 5	PR2 , AK2 , AX2 , ASH2, AMS2, AMH2, AME2, ATN2, AO2 , AQF2, AE2 , MM2 , ADJ2, RM2 , PN2 ,
E- 4	AK3 , AZ3 , AMS3, AMH3, AME3, ATNC, ATN3, AO3 , AQB3, AE3 , PN3 , PC3 , MM3 , ADJ3, YN3 ,
E- 3	ATNAN, AN , PRAN, AKAN, AXAN, AMSAN, AMHAN, AMEAN, ADJAN, AJCAN, AOAN, AQBAN, AQFAN, AEAN, SN , FR , YNSN,
E- 2	AA , ASHAN, AMHAA, ADJAA, SA , FA ,
E- 1	AR ,

S PUBLIC WORKS

CHASE

LABOR TYPE AND GRADE	
LT	5100,
LTJG	5105,
E- 7	BUC, CEC, EOC,
E- 6	CM1, EO1,
E- 5	EOH2, EAS2,
E- 4	BUL3, CEP3, BLR3, EON3,
E- 3	EASCN, EADCN, ECNCA, CMACN, CN, SN,
E- 2	EA, SA, CMACA,
GS-12	801,
GS-11	802,
GS- 9	341,
GS- 7	301, 818,
GS- 5	1173, 301, 382,
GS- 4	570, 322, 301,
GS- 3	301, 312, 382,
WB-11	42002, 38006, 42006, 52004, 37003, 28005, 28006, 53006, 46005, 41004, 57010, 59003,
WB-10	46007, 36009, 41002, 55023,
WB- 9	54002, 54009, 54008, 54025, 57016,
WB- 8	47057, 36053,
WB- 7	57055,
WB- 6	54025,
WB- 5	47045, 35042, 58006,
WB- 1	35044,
WC-65	47030,
WS-73	47047,
WS-57	47040, 47001,
WS-56	47040,
WS-55	54051,
WC-54	47056,
WS-41	53004, 58031,
WS-40	41002,
WC-39	47042,
WC-37	47003,
WC-35	47000,

68 SECURITY

CHASE

LABOR TYPE AND GRADE								
LCDR	1315,							
LTJG	1325,							
E- 7	BTC,							
E- 6	ABH1,	MM1,	EM1,	BM1,	EN1,	GMG1,	RT1,	SM1,
E- 5	EN2,	RT2,	QM2,	MM2,	SM2,	ABH2,	SFP2,	
E- 3	SN,	AN,						
E- 2	SA,							
GS-10	081,							
GS- 8	C81,							
GS- 7	C81,							
GS- 6	081,							
GS- 5	301,	C81,						
GS- 4	C81,							
GS- 3	C81,							
GS- 2	322,							

2100 SUPPLY STAFF

CHASE

LABOR TYPE AND GRADE		
LCDR	31CC,	
LT	31CC,	
E- 9	SKCM,	
E- 6	AK1,	
E- 5	AK2,	SK2,
GS- 9	2001,	
GS- 7	44,	
GS- 4	312,	322,
GS- 3	305,	
GS- 2	302,	

A COMMAND AND STAFF

KINGSVILLE

LABOR TYPE AND GRADE	
CAPT	1310,
CDR	1310, 4100,
LCDR	1310,
LT	1635, 1465, 4105,
E- 7	ENC,
E- 6	JO1, SM1, EN1,
E- 5	JO2,
E- 4	JO3,
E- 3	AN, SN,
GS- 4	318, 312,
GS- 2	322,

F DATA PROCESSING

KINGSVILLE

LABOR TYPE AND GRADE	
E- 4	DP3,
GS- 5	356,
GS- 3	356,
GS- 2	356,

B COMPTROLLER

KINGSVILLE

LABOR TYPE AND GRADE	
LCDR	3100,
WO- 2	7982,
GS- 9	504,
GS- 7	560,
GS- 6	520,
GS- 4	501, 520,
GS- 3	322,

G SUPPLY

KINGSVILLE

LABOR TYPE AND GRADE	
LT	3100,
LTJG	3105,
WO- 2	7982,
E- 7	ABHC, AKC, ABFC, CSC,
E- 6	AK1, SK1, AMF1, BT1, CS1,
E- 5	AK2, SK2, CS2, SH2, SM2,
E- 4	AK3, SK3, CS3,
E- 3	AN, AKAN, SN, SKSN, BTFN, CSSN,
E- 2	AA, SA,
GS- 9	2001,
GS- 8	2101,
GS- 7	2050,
GS- 6	2020,
GS- 5	520, 2050, 2135, 2005,
GS- 4	2005, 2020,
GS- 3	322, 2005,
GS- 2	322,
WB-10	69054,
WB- 8	44021,
WB- 6	69007, 57054,
WB- 5	69007, 69012, 54013, 58006,
WB- 1	35006, 35046,
WS-40	69056,
WX-47	46022,
WX-45	69045,

C INDUSTRIAL RELATIONS

KINGSVILLE

LABOR TYPE AND GRADE	
E- 6	MM1, QM1, RD1,
E- 5	EM2,
GS-11	201,
GS- 9	018,
GS- 7	203,
GS- 5	230,
GS- 4	203,
GS- 3	322,
GS- 2	322,

D ADMINISTRATION

KINGSVILLE

LABOR TYPE AND GRADE	
CDR	1310,
LCDR	1313, 1315,
LT	6202, 1361, 1320,
LTJG	1100,
ENS	1105, 1305,
E- 8	BMCM, SDCM,
E- 7	BMC, AKC, SFC, DKC, MMC, PCC, YNC,
E- 6	BM1, BT1, SF1, SM1, MM1, PN1,
E- 5	BM2, YN2, BT2, SD2, IC2, SM2, MM2, RM2,
E- 4	SD3, EM3, PC3, CYN3,
E- 3	CYNSN, SN, AN, DKSN, FN, CN, YNSA, TN, TDSN,
E- 2	AA, SA, FA, CA, AMHAA, ADRAA, TA,
GS- 7	1410,
GS- 5	322, 204, 525, 318, 305,
GS- 4	305, 530, 322, 312, 305,
GS- 3	322, 322, 204,
GS- 2	322, 302, 350,

J AIRCRAFT MAINTENANCE

KINGSVILLE

LABOR TYPE AND GRADE	
CDR	131C,
LCDR	134C, 670C,
LT	6852, 5802, 6602,
LTJG	6802,
E- 9	AFCM, AVCM,
E- 7	AFC, ADJC, ASC, AKC, AMSC, AOC,
E- 6	ADJ1, AT1, AMS1, AK1, PR1, AMH1, AE1, PR1, AS1, AO1,
E- 5	ADJ2, AZ2, AMH2, AMS2, AE2, AQF2, ATN2, PR2, ASE2, ASM2, AMF2, AO2, ADR2,
E- 4	ADJ3, SK3, AE3, AMS3, AMH3, AQF3, ATN3, ASM3, PR3, ASH3,
E- 3	AZAN, ADJAN, AN, AKAN, AMSAN, ATNAN, ASMAN, ASEAN, ASHAN, AOAN,
E- 2	AA, ADJAA, MRFA, AMHAA, PRAA,
GS- 4	322, 305, 204C,
GS- 3	322,
WB-12	2600C1,
WB- 8	28092,
WB- 6	65CC4,
WB- 5	69CC7,
WB- 2	350C2,

4CD MEDICAL SERVICES

KINGSVILLE

LABOR TYPE AND GRADE	
CAPT	21CC,
CDR	22CC,
LCDR	2105,
LT	21C5, 21CC, 22C5,
E- 9	HMCM,
E- 7	HMC,
E- 6	HM1, DT1,
E- 5	HM2,
E- 4	HM3, DT3,
E- 3	HN, DN,
GS- 5	301, 61C,
GS- 4	322,

P OPERATIONS

KINGSVILLE

LABOR TYPE AND GRADE	
LCDR	1315, 6612, 1332, 1312,
LT	6612, 6802, 6602,
LTJG	1385, 1361,
E- 8	ACCS, ETCS,
E- 7	ACC, PHC, ETC, ENC, ATC, ADJC,
E- 6	AC1, ABH1, PH1, SK1, EN1, ADR1, ADJ1,
E- 5	AC2, ADR2, PH2, ETN2, ETR2, AE2, AMH2, ADJ2,
E- 4	AC3, ABH3, ASE3, PH3, ETN3, ETR3, ADR3, AE3, AMH3, ADJ3,
E- 3	ACAN, AN, PHAN, ETNSN, SN, ADRAN, ATNAN, ADJAN,
E- 2	AA, FA,
GS-11	2152,
GS- 7	2152,
GS- 5	318, 2152,
WB- 6	57054,
WB- 2	35027,

R TRAINING

KINGSVILLE

```
LABOR TYPE
AND GRADE
CDR        1310,
LT         [illegible], 13[illegible],
E- 7       [illegible],
E- 6       [illegible],
E- 5       [illegible],
E- 4       [illegible],
E- 3       [illegible],     [illegible],
GS-11      1312,
GS- [illegible]     [illegible],
GS- 5      [illegible],
GS- 4      [illegible],
GS- 3      [illegible],
```

SK TRARON 21

KINGSVILLE

```
LABOR TYPE
AND GRADE
CDR        1310,
LCDR       1310,
LT         210[illegible],
WO- 4      1310, 131[illegible],
WO- 3      1310, 1315, 6[illegible],
WO- 2      7[illegible], 1385, 1310, 1315, 1390,
WO- 1      [illegible], [illegible], 710[illegible],
E- [illegible]     AFC[illegible],
E- 8       AFC[illegible], AMCS,
E- 7       YNC , [illegible]MC , ADJC, ATC , AOC , AEC , AMSC, AMHC, AMEC, AKC , AZC ,
E- 6       BM1 , YN1 , PN1 , ADJ1, AT1 , AC1 , AAC1, AE1 , AMS1, AMH1, AME1,
           PR1 , AK1 , AZ1 , AC1 , AE[illegible] ,
E- 5       YN2 , PN2 , [illegible]N2 , SEM2, ADJ2, ATN2, ATR2, AC2 , AOE2, AE2 , AMS2,
           AMH2, AH[illegible], AME2, PR2 , AK2 , AZ2 , ASH2, AE[illegible] , AME ,
E- 4       ATN3, [illegible]M3 , YN3 , PN3 , SEM3, ADJ3, AC3 , AOE3, AT3 , AMS3, AMH3,
           AME3, PR3 , AK3 , AZ3 , ASE3,
E- 3       ADJAN,ADJ[illegible],ATNAN,AICAN,AOEAN,AMSAN,AMHAN,AMEAN,ASEAN, YNSN, SN ,
           AOAN, ATAN, PRAN, AKAN, AZAN, AN ,
E- 2       ADJAA,AMSAA,AMHAA, SA , ACAA, AA ,
E- 1       [illegible] ,
```

SL TRARON 22

KINGSVILLE

```
LABOR TYPE
AND GRADE
CDR        1310,
LCDR       [illegible], 1310,
LT         13[illegible], 1310, 1315, [illegible], [illegible],
LTJG       [illegible], 1315, 13[illegible], 13[illegible],
ENS        [illegible], [illegible],
E- [illegible]     [illegible],
E- 8       [illegible], [illegible],
E- 7       YNC , [illegible] , AZC , [illegible] , AKC , AMHC, [illegible] , [illegible] , [illegible] , [illegible] ,
E- 6       YN1 , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , AZ1 , A[illegible] , AMH1, [illegible] , AT[illegible] ,
           [illegible] , AK1 , [illegible] , [illegible] , [illegible] , AC1 ,
E- [illegible]     [illegible] , [illegible] , [illegible] , YN2 , AZ2 , AK2 , ADJ2, [illegible] , AMH2, [illegible] , [illegible] ,
E- [illegible]     YN3 , [illegible] , AZ3 , AK3 , ADJ3, [illegible] , AMH3, [illegible] , [illegible] , [illegible] , [illegible] ,
           [illegible] , [illegible] , [illegible] ,
E- [illegible]     [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] ,
           [illegible] , [illegible] , [illegible] , [illegible] , [illegible] , [illegible] ,
E- [illegible]     [illegible] ,
```

SM **TRARON 23**

KINGSVILLE

```
LABOR TYPE
AND GRADE
  CDR        1310,
  LCDR       1310, 1315, 6650, 1357,
  LT         1310, 1315, 2105,
  LTJG       1105, 1315, 1310, 1390,
  ENS        1105, 1355,
   E- 8      AOCS, AMCS,
   E- 7      ATC , AOC , AEC , AMSC, AMHC, AKC , QMC , YNC , ADJC,
   E- 6      ATU , AT1 , AO1 , AE1 , AMS1, AMH1, AME1, PR1 , AK1 , AZ1 , YN1 ,
             PN1 , MM1 , SF1 , ADJ1,
   E- 5      AE2 , ATN2, AO2 , ACF2, AMS2, AMH2, AME2, PR2 , AK2 , AZ2 , BM2 ,
             YN2 , PN2 , ADJ2,
   E- 4      AMS3, ATN3, AO3 , ACF3, AE3 , AMH3, AME3, PR3 , AK3 , AZO , AZ3 ,
             AZE3, YN3 , SFM3, ADJ3,
   E- 3     AMHAN,AMSAN,ADJAN,CFJON,ATPAN,ATNAN,AOFAN,AWBAN,AMEAN, AN , ADAN,
             AEAN, PRAN, AKAN, AZAN,AJDAN, YNSN, UNSN, PNSN, SN ,
   E- 2     EMSAA,ADJAN,ADJAA,AMSAA,AMHAA,AMEAA, AEAA, PRAA, AA , SA , FA ,

   E-21      EN ,
```

SB **SECURITY**

KINGSVILLE

```
LABOR TYPE
AND GRADE
  LT         1320,
   E- 8      ABCS,
   E- 7      BTC, ABHC,
   E- 6      BT1,  SM1,  MM1,  BM1, ABH1,
   E- 5      MM2,  EM2,  PR2,  CE2, ABH2, SFP2,
   E- 3       SN,   FN,   AN,
   E- 2       FA,   AA,   SA,   AA,
  GS-10      C81,
  GS- 9      C8C,
  GS- 8      C81,
  GS- 7      C81,
  GS- 6      C81,  C82,
  GS- 5      C71,
  GS- 4      312,  C81,
  GS- 3      333,  C81,
```

S PUBLIC WORKS

KINGSVILLE

```
LABOR TYPE
AND GRADE
  LCDR       510C,
  LTJG       510S,
  ENS        510S,
   E- 7       BUC,  SWC,  EOC,  BTC,  ENC,
   E- 6       CM1,  EO1,  UT1,
   E- 5       BU2,  CM2,  UT2,  EO2,  CE2,
   E- 4       EO3, EON3,
   E- 3      EOCN, BUCN,
   E- 2      CECA, EOCA,   CA,
  GS-12       801,
  GS-11       810,  830,
  GS- 9      1173,  341,  802,
  GS- 7       301,
  GS- 5      1173,  301,
  GS- 4       520,  312,  301,  322,
  GS- 3       322,  301,
  WB-11     46005,28005,28006,53006,42006,42004,53015,38006,37003,28008,58003,

  WB-10     46007,53011,41002,58023,38060,
  WB- 9     54028,54009,54008,57016,
  WB- 7     57055,
  WB- 6     54025,57054,
  WB- 5     69007,41002,28005,47049,36001,58006,
  WB- 4     57005,
  WB- 3     38002,
  WB- 2     35002,
  WB- 1     35066,
  WS-89     47040,
  WS-72     47251,
  WS-57     28005,47040,54051,
  WS-55     54025,
  WS-51     47056,
  WS-40     46007,41002,
  WX-49     58044,
  WD-38     47042,
  WD-38     47058,
  WD-38     28004,
  WD-37     67005,
  WD-35     47052,
```

2100 SUPPLY STAFF

KINGSVILLE

```
LABOR TYPE
AND GRADE
  CDR        2100,
  LTJG       1305,
   E- 8      SKCS,
   E- 7       AKC,
   E- 5       SK2,
  GS-10       341,
  GS- 4       314,
  GS- 3       322,
```

	SYSTEM ELEMENT	(GRADUATIONS)				MONTHLY AVERAGE	ANNUAL AVERAGE
		Jan 69	Feb 69	Mar 69	Apr 69		
KINGSVILLE MODEL	VT21	15	12	24	14	16.2	199
	VT22	12	11	24	15	15.5	190
	VT23	14	9	15	17	13.7	169
CHASE MODEL	VT24	3	16	14	6	9.7	119
	VT25	5	13	11	13	10.5	129
	VT26	10	8	15	9	10.5	129
Systems Annual FPOR							935

Figure 5-1. Final Products For Advanced Jet Systems At NAS Kingsville/NAS Chase

SYSTEM ELEMENT		(GRADUATIONS)			MONTHLY AVERAGE	ANNUAL AVERAGE
	Jan 69	Feb 69	Mar 69	Apr 69		
VT27	12	26	35	37	27.5	347
VT28	12	16	35	34	24.3	298
VT29	40	57	63	55	53.8	660
VT31	14	21	29	40	26.0	319
Systems Annual FPOR						1624

Figure 5-2. Final Products For Advanced Prop Systems At NAS Corpus Christi

SECTION 6

PROCESS ANALYSIS

6. Process Analysis

PRODUCT DISTRIBUTION RULES

Users of the Manpower Allocation Model for CNAVANTRA must be aware of the intermediate product distribution rules for each air station. Accordingly, the distribution rules are listed by subcost center for the three air stations.

The following pages contain intermediate product distribution rules, listed by subcost center, by the appropriate cost center for NAS Corpus Christi, Chase and Kingsville. The following abbreviations are used:

O = Officers
E = Enlisted Men
C = Civilians
S = Students

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 1 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
A	COMMAND AND STAFF		
1A10	Command/Staff	Average number of personnel on base	All cost centers by % O, E,C
1A30	Public Affairs	Number of actions completed	All cost centers by % O, E,C
1A40	Legal	Number of legal cases	All cost centers and trarons by % O,E,C
9931	Chaplain's Office	Number of military personnel served	All cost centers and trarons by % O,E,S
B	COMPTROLLER		
1C10	Administration	Number of personnel in 1C	Consumed internally
1C20	Internal Review	Number of procedural studies and audits completed	Cost Center A
1C40	Accounting	Number of documents processed	All cost centers by % O, E,C
1C50	Payroll	Number of civilians on payroll	All cost centers by % C
1C70	Disbursing	Number of transactions	All cost centers by % O, E
C	INDUSTRIAL RELATIONS		
1D10	Administration	Number of civilians on base	All cost centers by % C
1D20	Employment	Number of personnel actions	All cost centers by % C
1D30	Wage-Class FCN	Number of classifications or reviews completed	All cost centers by % C
1D40	Employee Relations	Number of civilian employees	All cost centers by % C
1D50	Employee Service	Number of civilian employees	All cost centers by % C
1D60	Training	Number of students enrolled	All cost centers by % C

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 2 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
D	<u>ADMINISTRATION</u>		
1E10	Administration	Number of military personnel	All cost centers by % O, E
1E20	Officer Personnel Records	Number of officer records	All cost centers by % O, S; trarons by % S
1E30	Enlisted Personnel	Number of enlisted personnel records	All cost centers by % E
9934	CPO/SNCO Club	Number of eligible personnel	All cost centers and trarons by % E
9941	Commissary Store	Volume of sales	All cost centers by % O, E,S
6A30	Tolls, Long Distance	Number of off-station calls	All cost centers by % O, E,C
1E40	Training	Number of students enrolled	All cost centers by % O, E
9921	Barracks	Number of residents	All cost centers by % E
9922	BOQ's	Number of residents	All cost centers and trarons by % O,S
9932	Commissioned Officers Mess	Number of officer population	All cost centers and trarons by % O,S
9937	Special Services	Number of military population served	All cost centers and trarons by % O,E
F	<u>DATA PROCESSING</u>		
1H10	Administration	Number of personnel in 1H	Consumed internally
1H30	ADP Operations	Number of equipment operating hours	All cost centers by % O, E,C
1H40	Keypunch Operations	Number of cards	Consumed internally
1H50	ADP Clerical Operations	Number of documents processed	Consumed internally
G	<u>SUPPLY</u>		
2110	Receipt	Measurement ton	Consumed internally
2121	Packing	Unit packs	Consumed internally

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 3 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
2122	Bulk Issue	Measurement tons, short tons, and line items	Consumed internally
2123	Bin Issue	Line item	Consumed internally
2124	Shipping Measurement	Measurement ton	Consumed internally
2131	Care of Material Storage	Measurement ton	Consumed internally
2132	Rewarehousing	Measurement ton	Consumed internally
2133	Preservation Packaging	Weighted unit packages	Consumed internally
2136	Inventory	Line items	Consumed internally
2144	Trans-shipment	Measurement ton	Consumed internally
2210	Requisition Processing	Line items	Consumed internally
2220	CTHSTK Con CPS	Line items	Consumed internally
2520	Cataloging	Number of identifications	Consumed internally
2141	Bulk Fuel	Barrels	Cost Center P and trarons by % flying hours
2330	Household Goods	Application	All cost centers by % O, E
2710	Procurement Plan	Procurement line items processed	All cost centers and trarons by % O,E,C,S
2720	Contract Execution	Procurement actions processed	All cost centers by % O, E,C
2820	Contract Administration	Number of contracts requiring contract administration action	Cost Center A
2310	Freight	Line items	All cost centers and trarons by % O,E,C,S
9911	Mess Hall/Galley	Daily rations issued	All cost centers and trarons by % O,E,S
9943	Retail Clothing	Volume of sales	All cost centers and trarons by % O,E,S

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 4 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
J	AIRCRAFT MAINTENANCE		
AA10	Administration	Average number of personnel in AA	Consumed internally
AA20	Quality Control	Number of inspections	Consumed internally
AA30	Material Control	Number of line items	Consumed internally
AA40	Power Plant Eng.	Work orders completed	Cost Center P and trarons by % flying hours
AA50	Airframes	Work orders completed	Cost Center P and trarons by % flying hours
AA60	Avionics	Work orders completed	Cost Center P and trarons by % flying hours
AA80	Aviator Equipment	Work orders completed	Cost Center P and trarons by % flying hours
AA90	Support Equipment	Work orders completed	Cost Center P and trarons by % flying hours
4CD	MEDICAL SERVICES		
4C00	Medical Facility	Number of patients	All cost centers and trarons by % O,E,S
4D00	Dental Facility	Number of visits	All cost centers and trarons by % O,E,S
P	OPERATIONS		
6C10	Administration	Average number of personnel in 6C	Consumed internally
6C20	Aircraft Control	Number of take-offs/ landings	All trarons by % flying hours
6C50	Ground Electronics	Cubic feet of elec- tronic devices	All cost centers and trarons by % O,E,C,S
6C60	Photo Services	Number of pictures	Consumed internally
6D20	Operations	Number of take-offs/ landings	All trarons by % S
R	TRAINING		
6J30	Training Operations Academic	Number of students graduated	Cost Centers J and P and trarons by % O,E,S

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET [illegible] OF [illegible])

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
SR	TRARON 27		
SR10	Command/Executive Offices	Average number of personnel in SR	Consumed internally
SR20	Administration	Number of personnel supported	Consumed internally
SR30	Training	Students graduated	Final product
SR40	A/C Maintenance Organic	Number of A-3 status A/C assigned	Cost Center J
SS	TRARON 28		
SS10	Command/Executive Offices	Average number of personnel in SS	Consumed internally
SS20	Administration	Number of personnel supported	Consumed internally
SS30	Training	Students graduated	Final product
SS40	A/C Maintenance Organic	Number of A-3 status A/C assigned	Cost Center J
ST	TRARON 29		
ST10	Command/Executive Offices	Average number of personnel in ST	Consumed internally
ST20	Administration	Number of personnel supported	Consumed internally
ST30	Training	Students graduated	Final product
ST40	A/C Maintenance Organic	Number of A-3 status A/C assigned	Cost Center J
SW	TRARON 31		
SW10	Command/Executive Offices	Average number of personnel in SW	Consumed internally
SW20	Administration	Number of personnel supported	Consumed internally
SW30	Training	Students graduated	Final product
SW40	A/C Maintenance Organic	Number of A-3 status A/C assigned	Cost Center J

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 6 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
6B	SECURITY		
6B10	Administration		Throughput
6B20	Police/Guard (Civilian)		Throughput
6B30	Military Guard		Throughput
6B60	Fire, A/C Rescue		Throughput
6B80	Brig		Throughput
S	PUBLIC WORKS		
7100	Buildings		Throughput
7540	Communications Lines		Throughput
7600	Utility Plants		Throughput
7830	Emergency Service Work R/P		Throughput
8200	Steam and Hot Water		Throughput
9110	Administration (P.W.)		Throughput
9120	Engineering (P.W.)		Throughput
9130	Administration of Family Housing		Throughput
9200	Other P.W. Shop Operations		Throughput
9400	Does not appear in manual		Throughput
9500	Mission Operations		Throughput
21	SUPPLY STAFF		
2100	Supply Staff		Throughput
STAF	CNAVANTRA STAFF		
1A1*	Command/Staff		Throughput
993*	Chaplain's Office		Throughput
1A4*	Legal		Throughput
1A3*	Public Affairs		Throughput

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CORPUS CHRISTI

(SHEET 7 OF 7)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
1B1*	Management Eng. (Operations)		Throughput
1C0*	Comptroller		Throughput
6C0*	Air Operations		Throughput
1E0*	Military Personnel		Throughput
200*	Storage and Warehousing Ops.		Throughput
6J0*	Training (General)		Throughput
910*	Public Works Administration		Throughput

* The asterisk in the fourth column of the RMS Code differentiates personnel assigned to the STAFF cost center and those assigned to a Naval Air Station cost center with an identical RMS Code.

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CHASE
(SHEET 1 OF 5)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
A	COMMAND AND STAFF		
1A10	Command/Staff	Average number of personnel on base	All cost centers by % O, E,C
1A40	Legal	Number of legal cases	All cost centers and trarons by % O,E,S
9931	Chaplain's Office	Number of military personnel served	All cost centers and trarons by % O,E,S
B	COMPTROLLER		
1C10	Administration	Number of personnel in cost center 1C	Consumed internally
1C20	Internal Review	Number of procedural studies and audits completed	Cost Center A
1C40	Accounting	Number of documents processed	All cost centers by % O, E,C
1C50	Payroll	Number of civilians on payroll	All cost centers by % C
C	INDUSTRIAL RELATIONS		
1D10	Administration	Number of civilians on base	All cost centers by % C
1D20	Employment	Number of personnel actions	All cost centers by % C
1D40	Employee Relations	Number of civilian employees	All cost centers by % C
1D60	Training	Number of students enrolled	All cost centers by % C
D	ADMINISTRATION		
1E10	Administration	Number of military personnel	All cost centers by % O, E
1E30	Enlisted Personnel	Number of enlisted personnel records	All cost centers by % E
1J10	Printing and Repro (Indus. Funding Act)	Number of machines used	All cost centers and trarons by % O,E,C,S

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CHASE
(SHEET 2 OF 5)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
6A10	Administration	Average number of personnel in 6A	All cost centers by % O, E,C
9922	BOQ's	Number of residents	All cost centers and trarons by % O,S
9937	Special Services	Number of military population served	All cost centers and trarons by % O,E
F	DATA PROCESSING		
1H10	Administration	Number of personnel in 1H	Consumed internally
1H40	Keypunch Operations	Number of cards	All cost centers by % O, E,C
G	SUPPLY		
2110	Receipt	Measurement ton	Consumed internally
2124	Shipping	Measurement ton	Consumed internally
2136	Inventory	Line items	Consumed internally
2141	Bulk Fuel	Barrels	Cost Center P and trarons by % flying hours
2210	Requisition Processing	Line items	Consumed internally
2220	CTHSTK Con SPS	Line items	Consumed internally
2710	Procurement Plan	Procurement line items processed	All cost centers and trarons by % O,E,C,S
9911	Mess Hall/Galley	Daily rations issued	All cost centers and trarons by % O,E,S
9943	Retail Clothing	Volume of sales	All cost centers and trarons by % O,E,S
J	AIRCRAFT MAINTENANCE		
AA10	Administration	Average number of personnel in AA	Consumed internally
AA20	Quality Control	Number of inspections	Consumed internally

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CHASE
(SHEET 3 OF 5)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
AA30	Material Control	Number of line items	Internally Consumed in AA
AA40	Power Plant Eng.	Work orders completed	Cost Center P and trarons by % flying hours
AA50	Airframes	Work orders completed	Cost Center P and trarons by % flying hours
AA60	Avionics	Work orders completed	Cost Center P and trarons by % flying hours
AA80	Aviator Equipment	Work orders completed	Cost Center P and trarons by % flying hours
AA90	Support Equipment	Work orders completed	Cost Center P and trarons by % flying hours
4CD	MEDICAL SERVICES		
4C00	Medical Facility	Number of patients	All cost centers and trarons by % O,E,S
4D00	Dental Facility	Number of visits	All cost centers and trarons by % O,E,S
P	OPERATIONS		
6C10	Administration	Average number of personnel in 6C	Internally consumed in 6C
6C20	Aircraft Control	Number of take-offs/ landings	All trarons by % flying hours
6C30	Aircraft Terminal	Lbs. of cargo and weight of passengers	All trarons by % flying hours.
6C50	Ground Electronics Maintenance	Cubic feet of electronic devices	All cost centers and trarons by % O,E,S,C
6C60	Photo Services	Number of pictures	Internally consumed in 6C
6C70	Ordnance	Number of trained and qualifed personnel	Internally consumed in 6C
6F30	Aircraft Maintenance Organic	Number of work orders completed	Internally consumed in 6F
R	TRAINING		
6J10	Training Operations General	Students graduated	Cost Centers J and P and trarons by % O,E,S

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CHASE

(SHEET 4 OF 5)

RMS CODE	SUBCOST CENTER	WORK ORDERS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
6J30	Training Operations Academic	Students graduated	Cost Centers J and P and trarons by % O,E,S
SN	TRARON 24		
SN10	Command and Executive Offices	Average number of personnel in SN	Consumed internally in SN
SN20	Administration	Number of personnel supported	Consumed internally in SN
SN30	Training	Students graduated	Final product
SN40	A/C Maintenance, Organic	Number of aircraft assigned	Cost Center J
SO	TRARON 25		
SO10	Command and Executive Offices	Average number of personnel in SO	Consumed internally in SO
SO20	Administration	Number of personnel supported	Consumed internally in SO
SO30	Training	Students graduated	Final product
SO40	A/C Maintenance, Organic	Number of aircraft assigned	Cost Center J
SP	TRARON 26		
SP10	Command and Executive Offices	Average number of personnel	Consumed internally in SP
SP20	Administration	Number of personnel supported	Consumed internally in SP
SP30	Training	Students graduated	Final product
SP40	A/C Maintenance, Organic	Number of aircraft assigned	Cost Center J
S	PUBLIC WORKS		
7600	Utility Plants		Throughput

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS CHASE

(SHEET 5 of 5)

RMS CODE	SUBCOST CENTER	WORK UNITS (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
7830			Throughput
9110	Administration P.W.		Throughput
9120	Engineering P.W.		Throughput
9130	Administration of Family Housing		Throughput
9400	Vehicle Operation		Throughput
6B	SECURITY		
6810	Security Administration		Throughput
2100	SUPPLY STAFF		
2100	Supply Staff		Throughput

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE
(SHEET 1 OF 6)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
A	COMMAND AND STAFF		
1A10	Command/Staff	Average number of personnel at NAS	All cost centers by % O, E,C
1A30	Public Affairs	Number of actions completed	All cost centers by % O, E,C
1A40	Legal	Number of legal cases	All cost centers and trarons by % O,E,S
9931	Chaplain's Office	Number of military personnel served	All cost centers and trarons by % O,E,S
B	COMPTROLLER		
1C10	Administration	Number of personnel in cost center 1C	Internally consumed in B
1C20	Internal Review	Number of procedural studies and audits completed	Cost Center A
1C40	Accounting	Number of documents processed	All cost centers by % O, E,C
1C50	Payroll	Number of civilians on payroll	All cost centers by % O, E,C
C	INDUSTRIAL RELATIONS		
1D10	Administration	Number of civilians on base	All cost centers by % C
1D20	Employment	Number of personnel actions	All cost centers by % C
1D40	Employee Relations	Number of civilian employees	All cost centers by % C
1D50	Employee Service	Number of civilian employees	All cost centers by % C
1D60	Training	Number of students enrolled	All cost centers by % C
D	ADMINISTRATION		
1E10	Administration	Number of military personnel	All cost centers by % O, E

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE
(SHEET 2 OF 6)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
1E20	O Personnel Records	Number of officer records	All cost centers by % O, S; trarons by % S
1E30	Enlisted Personnel	Number of enlisted personnel records	All cost centers by % E
1E40	Training	Number of students enrolled	All cost centers by % O, E
1J10	Printing and Repro (Indus. Funding Act)	Number of machines used	All cost centers and trarons by % O,E,C,S
6A10	Administration	Average number of personnel in 6A	All cost centers by % O, E,C
6A40	Telegraph	Number of messages	All cost centers by % O, E, C
9921	Barracks	Number of residents	All cost centers by % E
9922	BOQ's	Number of residents	All cost centers and trarons by % O,S
9937	Special Services	Number of military population served	All cost centers and trarons by % O,E
F	DATA PROCESSING		
1H40	Keypunch Operations	Number of cards	All cost centers by % O, E,C
G	SUPPLY		
2110	Receipt	Measurement ton	Internally consumed in G
2121	Packing	Unit packs	Internally consumed in G
2123	Bin Issue	Line item	Internally consumed in G
2124	Shipping	Measurement ton	Internally consumed in G
2136	Inventory	Line items	Internally consumed in G
2141	Bulk Fuel	Barrels	To Cost Center P and trarons by % flying hours
2142	Customer Service Store	Line items issued	All cost centers and trarons by % O,E,C,S
2210	Requisition Processing	Line items	Internally consumed in G
2220	CTHSTK Con CPS	Line items	Internally consumed in G

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE
(SHEET 3 OF 6)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
2310	Freight	Line items	All cost centers and trarons by % O,E,C,S
2520	Cataloging	Number of identifications	Internally consumed in G
2710	Procurement Plan	Procurement line items processed	All cost centers and trarons by % O,E,C,S
2720	Contract Execution	Procurement actions processed	All cost centers and trarons by % O,E,C
2900	Supply Administration	Number of actions completed	Internally consumed in G
9911	Mess Hall/Galley	Daily rations issued	All cost centers by % O, E,S
9943	Retail Clothing	Volume of sales	All cost centers by % O, E,S
J	AIRCRAFT MAINTENANCE		
AA10	Administration	Number of personnel	Internally consumed in J
AA20	Quality Control	Number of inspections	Internally consumed in J
AA30	Material Control	Number of line items	Internally Consumed in J
AA40	Power Plant (Engines)	Work orders completed	Cost Center P and trarons by % flying hours
AA50	Airframes	Work orders completed	Cost Center P and trarons by % flying hours
AA60	Avionics	Work orders completed	Cost Center P and trarons by % flying hours
AA30	Aviator Equipment	Work orders completed	Cost Center P and trarons by % flying hours
AA90	Support Equipment	Work orders completed	Cost Center P and trarons by % flying hours
4CD	MEDICAL SERVICES		
4C00	Medical Facility	Number of patients	All cost centers and trarons by % O,E,S
4D00	Dental Facility	Number of visits	All cost centers and trarons by % O,E,S

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE
(SHEET 4 OF 6)

RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
P	OPERATIONS		
6C10	Administration	Average number of personnel in 6C	Internally consumed in P
6C20	Aircraft Control	Number of take-offs/ landings	All trarons by % flying house
6C50	Ground Electronics Maintenance	Cubic feet of electronic devices	All cost centers and trarons by % O,E,C,S
6C60	Photo Services	Number of pictures	Internally consumed in P
6F10	Operations	Total number of aircraft flying hours	All trarons by % flying house
6F20	Flight Time	Number of flight hours	Internally consumed in P
6F30	A/C Maintenance Organic	Number of work orders completed	Internally consumed in P
R	TRAINING		
6J30	Training Operations Academic	Students graduated	Cost Centers J and P, and trarons by % O,E,S
SK	TRARON 21		
SK10	Command and Executive Offices	Average number of personnel in SK	Internally consumed in SK
SK20	Administration	Number of personnel supported	Internally consumed in SK
SK30	Training	Students graduated	Final product
SK40	A/C Maintenance Organic	Number of aircraft assigned	Cost Center J
SL	TRARON 22		
SL10	Command and Executive Offices	Average number of personnel in SL	Internally consumed in SL
SL20	Administration	Number of personnel supported	Internally consumed in SL
SL30	Training	Students graduated	Final product

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE
(SHEET 5 OF 6)

RMS	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
SL40	A/C Maintenance	Number of aircraft	Cost Center J
SM	TRARON 23		
SM10	Command and Executive Offices	Average number of personnel in SM	Internally consumed in SM
SM20	Administration	Number of personnel supported	Internally consumed in SM
SM30	Training	Students graduated	Final product
SM40	A/C Maintenance Organic	Number of aircraft assigned	Cost Center J
6B	SECURITY		
6B10	Security Administration	Average number of personnel in 6B	Throughput (not in process analysis)
S	PUBLIC WORKS		
7100	Buildings		Throughput (not in process analysis)
7410	Improved Grounds		Throughput (not in process analysis)
7600	Utility Plants		Throughput (not in process analysis)
7830	Emergency Service Work R/P		Throughput (not in process analysis)
7920	Maintenance Control Division		Throughput (not in process analysis)
8200	Steam and Hot Water		Throughput (not in process analysis)
8400	Potable Water		Throughput (not in process analysis
9110	Administration P.W.		Throughput (not in process analysis
9120	Engineering P.W.		Throughput (not in process analysis
9130	Administration of Family Housing		Throughput (not in process analysis

DISTRIBUTION RULES FOR INTERMEDIATE PRODUCTS AT NAS KINGSVILLE (SHEET 6 OF 6)			
RMS CODE	SUBCOST CENTER	WORK UNIT (OUTPUT)	INTERMEDIATE PRODUCT DISTRIBUTION
9200	Shop Operations P.W.		Throughput (not in process analysis)
9400	Vehicle Operations		Throughput (not in process analysis)
9500	Mission Operation		Throughput (not in process analysis
2100	SUPPLY STAFF		
2100	Supply Staff		Throughput (not in process analysis)

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13. ABSTRACT

A Manpower Allocation Model (MAM) and Productivity Measurement Model (PMM) for the Naval Air Advanced Training Command (CNAVANTRA) were developed to provide Navy management with tools for improved manpower planning, programming and budgeting. Development of the models included an investigation of the available data and an analysis of the processes which take place at various CNAVATRA facilities. After the models were formulated, computer programs were written, tested, and run using available data. The MAM provides a quantitative means of examining manpower requirements to support a range of pilot training rates in increments selected by the user at three naval air stations and nine training squadrons comprising CNAVANTRA, as well as its command headquarters staff. The model is designed to use data from RMS PRIME, OPNAV 5320, Enlisted Distribution and Verification Report (BUPERS Report 1080-14), and Student Training Progress Critiques. Other sources of data can also be utilized.

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